STK # 36275

INTERVIEW® 3000

Series Manuals

ATLC-107-895-101 Technical Manual
ATLC-107-895-102 BISYNC Training Manual
ATLC-107-895-103 ASYNC Training Manual
ATLC-107-895-104 SNA-X.25 Training Manual

Atlantic Research Corporation Teleproducts Division
5390 Cherokee Avenue, Alexandria, Virginia 22314

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ALEXANDRIA, VIRGINIA

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I. Identification (Part to be filled in by customer)

Equipment Name _____ Model No. _____ Ser. No. _____

Customer Firm Name _____ Contact Name _____

Division _____ Title _____

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City, State _____ Zip _____ Country _____

TWX/TLX _____ Prepared By _____

II. Detail description of problem, malfunction (use extra sheet if necessary) and any attempts at corrective action.

(Part to be filled in by customer) _____

Approximate hours/days of Operation to Failure _____

Failure Occurred During: Receiving Insp. _____ Cust. Installation _____ Field Use _____

III. Disposition (Part to be filled in by ARC Q.A.)

A. Field Repair Successful? _____ No _____ Yes

B. Unit Returned? _____ No _____ Yes Repair Order No. _____

C. Date Received For Repair _____ Date Shipped to Customer _____

D. Corrective Action: _____

_____ Prepared By _____

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- ☐ INTERVIEW
- ☐ INTERVIEW II
- ☐ INTERVIEW 3000
- ☐ INTERVIEW 3500
- ☐ INTERVIEW 3900
- ☐ INTERVIEW 4500
- ☐ DATA TECH 9600
- ☐ PMK04
- ☐ Other _____

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- ☐ PMK04
- ☐ Other _____

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6/15/81

Dear INTERVIEW 3500 User:

This binder is for storage of four Manuals for your new 3500.

In this binder is a BISYNC TRAINING MANUAL, ATLC-107-895-102, for use with the BISYNC Training Tape, TAP-895-102-1.4, and an X.25-SDLC TRAINING MANUAL, ATLC-107-895-104, to be used with the X.25-SDLC Training Tape, TAP-895-104-1.3. The ASYNC TRAINING MANUAL, ATLC-107-895-103, is also enclosed in this binder and is to be used with the ASYNC Training Tape, TAP-895-103-1. The training tapes and their accompanying training manuals comprise a very effective way of learning to use your 3500. We strongly urge that you employ them for initial training, no matter what data you intend to monitor.

The TECHNICAL MANUAL, ATLC-107-895-101, is also enclosed in this binder and will be your complete reference document for every aspect of 3500 operation and service.

You may obtain extra copies of each of these manuals and tapes by using the ordering information on the following page.

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7/8/80

ARC-37784	Extra Blank Tape
ATLC-107-895-100	Extra Operator's Guide
ATLC-107-895-101	Extra Technical Manual
ATLC-107-895-102	Extra BISYNC Training Manual
ATLC-107-895-103	Extra ASYNC Training Manual
ATLC-107-895-104	Extra X.25-SDLC Training Manual
TAP-895-102-1	BISYNC Training Tape
TAP-895-103-1	ASYNC Training Tape
TAP-895-104-1	X.25-SDLC Training Tape

Issue 1, June 1980

ADDENDUM

to

Technical Manual for INTERVIEW 3000 and 3500
ATLC-107-895-101, Issue 1, April 1980

SECTION 13: INTERACTIVE OPERATION WITH INTERSHAKE II

Replace pages 53 and 54 with the complete Section 13, pp. 53-53h.

SECTION 15: AUXILIARY INTERFACE

p. 58: Change the entries for 3500 Pins 17, 18, 19 to read as follows–

17	EDIT SELECT	71	1 LS TTL INPUT (SCHMIDT) When this pin goes high and the 3500 is set to DTM or TAPE/DTM and is in MONITOR mode, then the 3500 is automatically configured to work with the Inter-KEY Editor. When the lead returns to low, the 3500 resumes the previously entered user program.
18	AUX IN 2	–	1 LS TTL INPUT (SCHMIDT)
19	AUX IN 3	–	For future use

p. 58: Change the entries in the first three columns for 3500 Pins 32, 33, 34 to read

32	GND	63
33	DTM TAPE	69
34	DTM CLEAR	73

SECTION 16: MAINTENANCE AND SERVICE

p. 67, Figure 16-6: Change "Board E" to "Board F"

APPENDIX H

First column, line 4: Change "72 kbps FDX" to "56 kbps FDX"

First column, under TRIGGERS, Activity: delete "at 56 kbps FDX, approximately two"

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Replace the single page of Appendix I with the complete Appendix I.1, pp. 107-108c.

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13 Interactive Operation with INTERSHAKE II

This section on 3500-INTERSHAKE operation assumes that you are thoroughly familiar with the INTERSHAKE Test System as well as the INTERVIEW 3500. The discussion covers only those topics that are peculiar to combining the two instruments.

13.1 SOFTWARE VERSIONS

13.1.1 INTERSHAKE II (DTM-2). Modified Inter-KEY software is required when the INTERSHAKE Test System is to be operated with the INTERVIEW 3500. Inter-KEY software version DTM/3500 V1.2 incorporates these changes into the Standard DTM-2 Test System, while version DTM/3500 V1.3 applies to all M550 units. (Inter-KEY software level is shown in the heading of the automatic editor menu; see Figures 13-8 and 13-9.)

13.1.2 INTERVIEW 3500. For operation with the INTERSHAKE the 3500 must have software version 3.02 or higher.

13.2 INTERCONNECTIONS

Before the INTERVIEW 3500 and the INTERSHAKE can be used in combination, they must be properly connected together. Figure 13-1 shows a number of possible configurations that will be referred to in this section. You should consider these suggestions from the standpoint of your specific application.

Figure 13-1a shows connections for monitoring line data. Notice that each unit must have independent access to the RS-232 interface. An Auxiliary Interface Cable is installed between the 3500 50-pin Auxiliary Connector and the DTM-2 104-pin Auxiliary Connector. Control signals (Function 94 instructions) from the DTM-2 are sent to the 3500 via this cable.

Figure 13-1b shows four configurations for connecting the 3500 and the INTERSHAKE for interactive testing. Remember to select the correct DTM RS-232 port—Modem or Terminal—for your application.

CAUTION: The INTERSHAKE cannot send data to the 3500 through the auxiliary interface as was the case with the INTERVIEW I or II. Data of any type transmitted by the DTM to the 3500 is sent via the RS-232 interface. Therefore you must exercise caution not to interfere with a live system.

Figures 13-1c through 13-1e show three configurations for sending 3500 tape output to the DTM-2. The optional Tape Output Cable (OPT-895-09-L) shown in Figure 13-1d carries data from the 3500 Auxiliary Connector to a DTM-2 RS-232 port. Figure 13-1e shows a method that frees the INTERSHAKE's RS-232 ports for other use.

13.3 FUNCTION 94: DTM CONTROL OF THE 3500

13.3.1 3500 Source Selection (Parameters 1 Menu). For most cases, you should select DTM or TAPE/DTM for SOURCE on the Parameters 1 menu. When you select DTM, you can use either the EIA line or the DTM as data source; for TAPE/DTM, the data source must be the 3500 tape. LINE or TAPE may be selected for some special situations.

Figure 13-1

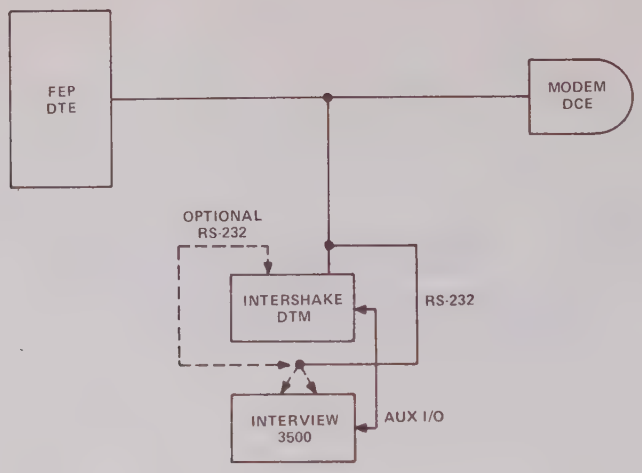

Figure 13-1a

TEST CIRCUIT LOOPED THROUGH 3500 AND INTERSHAKE

TEST CIRCUIT LOOPED THROUGH INTERSHAKE

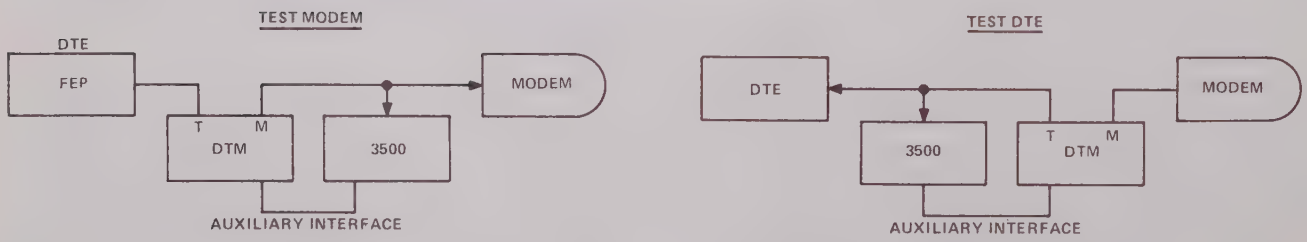

Figure 13-1b

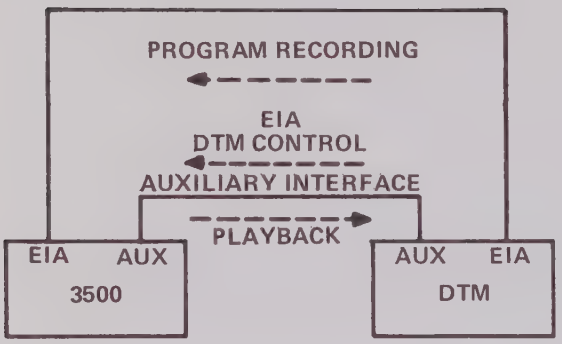

Figure 13-1c

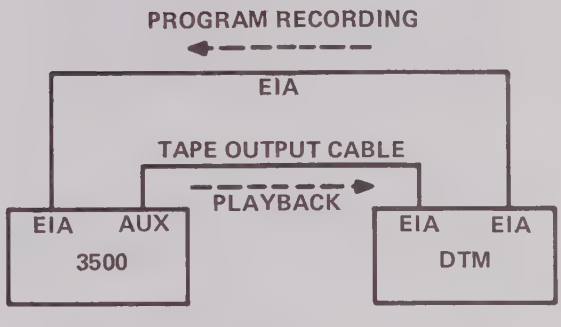

Figure 13-1d

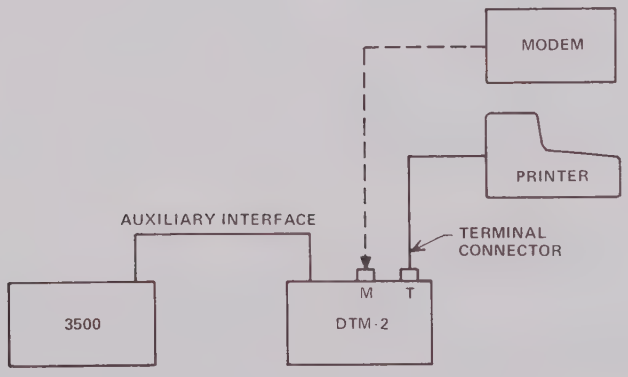

Figure 13-1e

13.3.2 Auxiliary Interface. Control instructions can be transmitted from the INTERSHAKE to the 3500 only via the Auxiliary Interface cable. The Auxiliary Interface becomes active when you have selected DTM or TAPE/DTM on the Parameters 1 menu of the 3500 and pressed the MONITOR key. See Section 15 of this manual for a detailed description of this interface.

13.3.3 Instruction List. DTM Function 94 is used for all control instructions to the 3500. These instructions, as well as other changes in Function 94 entailed by the software modifications for INTERSHAKE-3500 operation, are defined in Table 13-1.

Table 13-1

DTM Instruction		
Data	**Function**	**Description**
01	94	Clear CRT ON
00	94	Clear CRT OFF
11	94	Not Used; must be removed from existing DTM-2 programs
10	94	Not Used; must be removed from existing DTM-2 programs
21	94	Automatic Editor ON; must be removed from existing DTM-2 programs where it is used for page control of INTERVIEW I or II.
20	94	Automatic Editor OFF; must be removed from existing DTM-2 programs where it is used for page control of INTERVIEW I or II.
31	94	Freeze CRT ON
30	94	Freeze CRT OFF
41	94	3500 Tape START (new instruction)
40	94	3500 Tape STOP (new instruction)
51	94	Reverse Video ON
50	94	Reverse Video OFF
61	94	Half-Intensity Video ON
60	94	Half-Intensity Video OFF
71	94	Blink ON
70	94	Blink OFF
13	94	Sense 3500 Flag #6 ON (new instruction)
12	94	Sense 3500 Flag #6 OFF (new instruction)
23	94	Sense 3500 Flag #7 ON (new instruction)
22	94	Sense 3500 Flag #7 OFF (new instruction)
33	94	Sense 3500 Flag #8 ON (new instruction)
32	94	Sense 3500 Flag #8 OFF (new instruction)

13.3.4 Clear CRT. INTERSHAKE instruction 0194 turns on Clear CRT; 0094 turns Clear off. Approximately 2 ms is required for the 3500 processor to sense the Clear instruction. When CRT Clear is turned off, there is a 40-ms delay before any data transmitted by the INTERSHAKE can be displayed. We therefore suggest the following INTERSHAKE instruction sequence:

0194 Clear CRT
0280 Delay 2 ms
0094 Turn Clear CRT OFF
4080 Delay 40 ms

13.3.5 Page Control Instructions. Notice from the table that the Page 1 and Page 2 control instructions intended for the INTERVIEW I or II (data 10, 11, 20, 21) are not applicable to the 3500. Therefore, to use existing DTM programs whether stored or manually entered, you need to eliminate these instructions by whatever method is most convenient for the particular application.

DTM Flag 2 (Instructions 2194 and 2094) is now used for the Automatic Editor. It may also be used in an applications program to rewind and restart the tape: For this use, turn Flag 2 on (2194) for 1 msec and then turn it off (2094).

13.3.6 CRT Enhancements. When the DTM is used to control Reverse, Half-Intensity, or Blink, the enhancement is two characters early. This skew may be compensated in the DTM program.

13.3.7 3500 Flag Output to the DTM. When DTM or DTM/TAPE has been selected on the Parameters 1 menu, 3500 Flags 6, 7, and 8—controlled by the 3500 triggers—are output to the INTERSHAKE via the auxiliary interface as DTM input Flags 1, 2, and 3, respectively. The DTM program can sense the condition of these flags through Function 94 instructions (see Table 13-1).

13.3.8 Triggers. When DTM or TAPE/DTM is selected on the Parameters 1 menu, 3500 Trigger control of the CRT and TAPE is disabled. Both CRT and TAPE must be controlled manually or by the INTERSHAKE Function 94 program instructions. (CRT and TAPE selections will still show on the trigger menus, but cannot be used.) All other 3500 trigger actions may still be used.

13.4 MONITORING AND INTERACTIVE TESTING: INTER-KEY MODE 0

13.4.1 Line Data.

(1) For most applications, connect the DTM and 3500 as shown in Figure 13-1a or 13-1b.

(2) Load the DTM program by any method. (To load a DTM program from the 3500 tape, see Section 13.7.1.)

(3) Set up the INTERSHAKE panel.

(4) Load the 3500 parameters, either manually by making menu selections or from tape. Select DTM for SOURCE. The basic Parameters for the 3500 program must be identical with the INTERSHAKE setup.

(5) Set up the 3500's triggers, if you wish to use them. Remember not to use the CRT or TAPE control actions.

(6) Press the 3500 MONITOR key.

(7) Enter DTM RUN mode.

13.4.2 Replaying Taped Data.

(1) Usually data from the 3500 tape, including DTM-2 programs, should be replayed to the DTM through the Auxiliary Interface Cable (as in Figure 13-1c or 13-1e). The method of Figure 13-1e frees the RS-232 connectors on the DTM so that it can be connected to a printer or modem while the tape is being replayed.

(2) Load the DTM program by any method (see Section 13.7.1 to load a DTM program from the 3500 tape).

(3) Set up the DTM panel.

(4) Select TAPE/DTM on the 3500 Parameters 1 menu. Set up the rest of the Parameters 1 menu with the same parameters as the INTERSHAKE panel.

(5) Set 3500 triggers if you wish to use them. Remember that Set Tape and Set CRT cannot be used.

(6) Press the 3500 MONITOR key.

(7) Enter DTM RUN Mode.

Because control is not instantaneous, when data is replayed from the 3500 tape a character may be lost as the tape is started or stopped. When the DTM can be programmed to determine appropriate starting or stopping points, this character skew can be eliminated or at least kept to a minimum.

The tape may also be started or stopped manually with the Capture Memory keys on the 3500 keyboard.

Taped data may be replayed through the optional Tape Output Cable, in which case the DTM receives the taped data through an RS-232 port. (See Figure 13-1d.) In this case, TAPE must be selected on the Parameters 1 menu of the 3500. The DTM can analyze taped data in this configuration, but it cannot control the tape, which must be started and stopped manually from the 3500 keyboard.

13.5 INTERACTIVE TERMINAL TESTING: INTER-KEY MODE 2

Figure 13-1b suggests four methods of connecting the 3500-INTERSHAKE combination for interactive terminal operation (Inter-KEY Mode 2). For this use, LINE must be selected on the Parameters 1 menu.

If you select either DTM or TAPE/DTM, INTERSHAKE Flag 0 (Instruction 0094) is automatically used to indicate an active DTM keyboard. Since this is the Clear CRT flag for the 3500, it prevents any data from being displayed on the 3500 CRT while the DTM is in Mode 2.

When the INTERSHAKE bit switches are set to F0 for entering data into results memory, then even if LINE has been selected the data will not be displayed as it is being keyed in.

13.6 TRANSMITTING AND RECORDING DTM PROGRAMS: INTER-KEY MODE 3

With Inter-KEY software modifications DTM/3500 V1.2 and DTM/3500 V1.3, Modes 3 and 4 allow recording of 3500 and DTM-2 programs on the 3500's integral tape. Mode 3 records 3500-DTM programs on the tape and Mode 4 loads 3500-DTM programs from the tape. A single set of 3500 parameters and thirty or more 256-step DTM-2 Test Programs may be recorded in tandem on one 3500 tape.

13.6.1 3500 Program Recording. One 3500 program, including both parameters and triggers, can be recorded on a tape at any time. Since the 3500 program resides in a reserved location, it does not matter whether there are DTM programs already on the tape. Simply follow the procedure of Section 12.4.

13.6.2 INTERSHAKE Program Recording.

(1) On the 3500 Parameters 1 menu, select DTM for SOURCE.

(2) Set up the rest of the Parameters 1 screen for recording a DTM-2 Program. The DTM program is always recorded in ASCII code, 7 bits, odd parity, with ASYNC format. Select INTernal CLOCK and enter a SPEED to match that to be entered in the DTM. Figure 13-2 is an example.

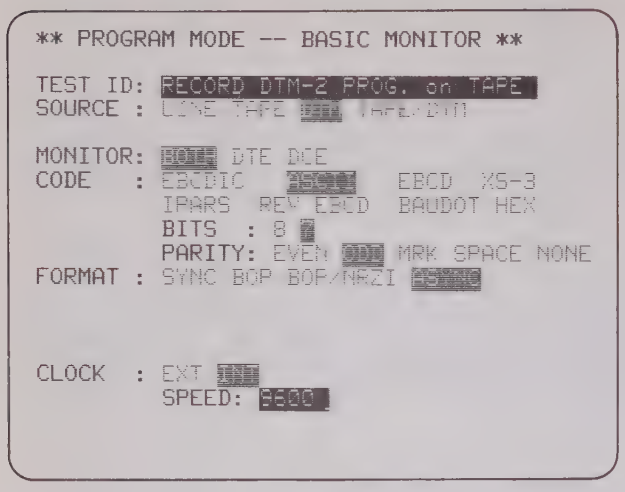
** PROGRAM MODE -- BASIC MONITOR **
TEST ID: RECORD DTM-2 PROG. on TAPE
SOURCE : LINE TAPE TAPE/DTM
MONITOR: MODEM DTE DCE
CODE : EBCDIC ASCII EBCD XS-3
IPARS REV EBCD BAUDOT HEX
BITS : 8 7
PARITY: EVEN ODD MRK SPACE NONE
FORMAT : SYNC BOP BOP/NRZI ASYNC
CLOCK : EXT INT
SPEED: 9600

Figure 13-2

(3) Set up the Parameters 2 menu (see Figure 13-3). The tape block at which you wish the DTM program recording to start must be entered in the START AT field under RECORD CONTROL.

A number of DTM programs may be recorded in sequence. Each additional program will automatically be recorded immediately after the preceding one. However, you can obtain a buffer zone—at least 3 blocks is desirable—by changing the START AT entry on the 3500 Parameters 2 menu before you record each program. This enables you to replace a program in the group without writing over any portion of its neighbors.

(4) Press the MONITOR key. The 3500 will move the tape to the selected starting block and then wait for the DTM-2 to control the operation (Figure 13-4 shows the display at this point).

(5) Set up the INTERSHAKE panel (consult the

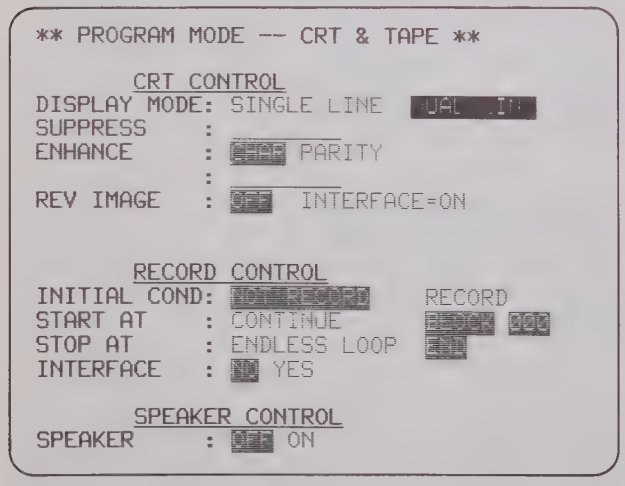
** PROGRAM MODE -- CRT & TAPE **
CRT CONTROL
DISPLAY MODE: SINGLE LINE DUAL LINE
SUPPRESS :
ENHANCE : OFF PARITY
:
REV IMAGE : OFF INTERFACE=ON
RECORD CONTROL
INITIAL COND: NOT RECORD RECORD
START AT : CONTINUE BLOCK 000
STOP AT : ENDLESS LOOP END
INTERFACE : NO YES
SPEAKER CONTROL
SPEAKER : OFF ON

Figure 13-3

Inter-KEY Operator's Manual, BSPM 877, for instructions on Mode 3 setup and operation). The setup must match that of the 3500 Parameters 1 menu:

Speed: match 3500
Code: ASCII
7 Bits
Odd parity
ASYNC, 1 stop

In Zone 3, select Test TERMINAL if the 3500 RS-232 cable is connected to the DTM's TERMINAL connector; Test MODEM if it is connected to the MODEM connector.

(6) If you want redundant recording, select DUAL LINE on the Parameters 2 menu. Connect a patch cord from the DTM-2 SIGS OUT test point (Zone 2) to the test point for Pin 2 or Pin 3, whichever is unlighted, in Zone 5. (See Figure 13-5.)

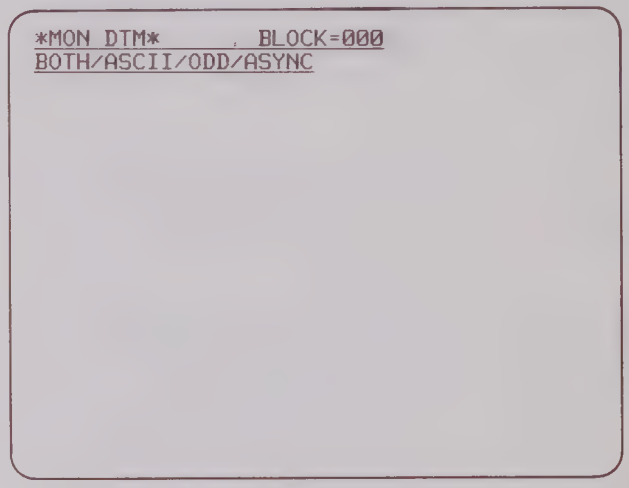

Figure 13-4

(7) You may now enter Inter-KEY Mode 3, select the program ID, and press ENTER. The DTM-2 will automatically start the 3500 tape, record the DTM-2 program, and stop the tape when recording is completed.

Approximately seven blocks of tape will be used for one 256-step program cell. Figure 13-6 is an example of the display during redundant recording.

CAUTION: If you enter Mode 4 while the 3500 is set up to record, i.e., when RECORD is selected on the Parameters 2 menu, the tape will be erased from this point until Mode 4 is reset.

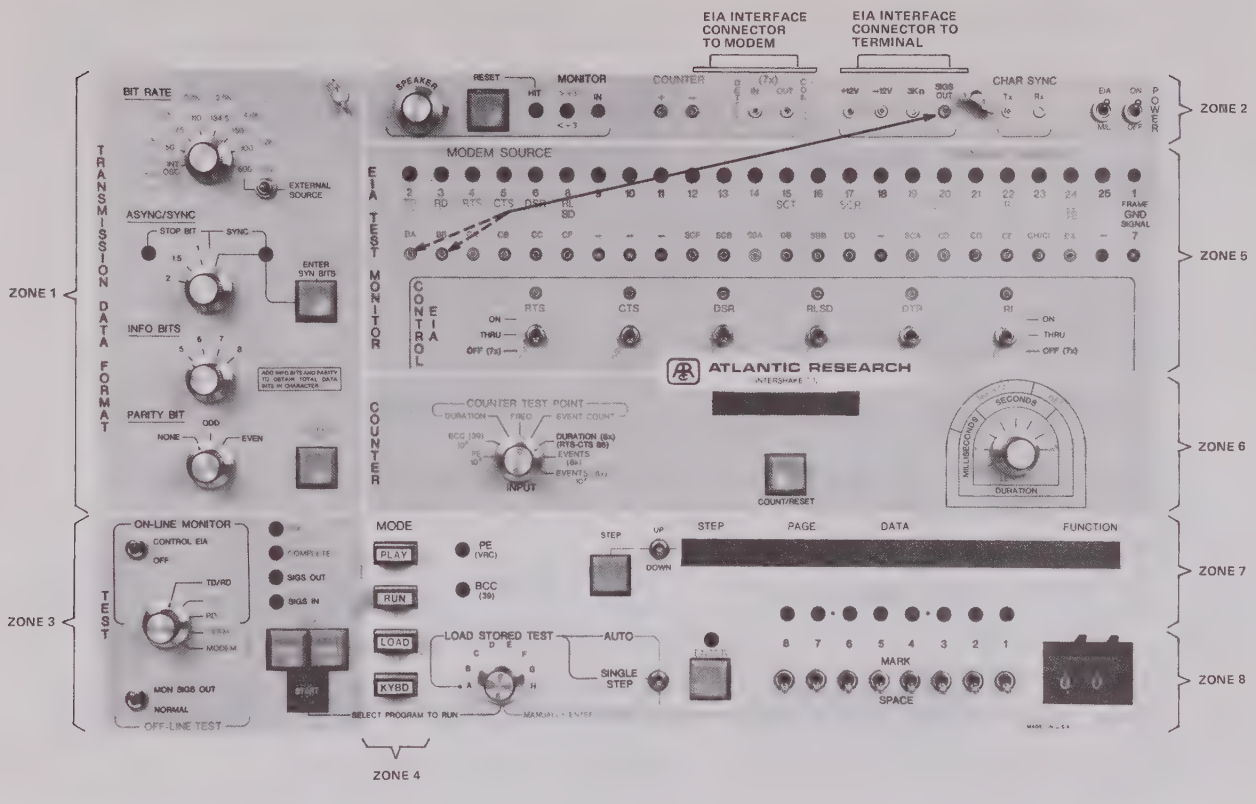

Figure 13-5

```
*MON DTM*          BLOCK=001
BOTH/ASCII/ODD/ASYNC
1g%+5047 FLG  4241 PRE  FF46 RTJ  CC41 P
1g%+5047 FLG  4241 PRE  FF46 RTJ  CC41 P
RE%+2D19 INT  8940 JMP  7F40 JMP  D946 R
RE%+2D19 INT  8940 JMP  7F40 JMP  D946 R
TJ%+0397 INT  0250 XMT  8441 PRE  7F40 J
TJ%+0397 INT  0250 XMT  8441 PRE  7F40 J
MP%+FF57 xmt  0058 BCC  8F40 JMP  3147 F
MP%+FF57 xmt  0058 BCC  8F40 JMP  3147 F
LG%+3290 SYN  2750 XMT  3
LG%+3290 SYN  2750 XMT  3
```

Figure 13-6

13.7 LOADING TAPED PROGRAMS: INTER-KEY MODE 4

13.7.1 DTM Programs.

(1) The DTM must be set up for Mode 4 in accordance with instructions in the Inter-KEY Operator's Manual, BSPM 877, Sections 4C and 4D.

(2) The playback speed entered on the 3500 Parameters 1 menu must match the speed entered in the DTM.

(3) There are basically two ways to load the program, and these are presented in Table 13-2.

13.7.2 3500 Program. You may load the 3500 program, either manually (Section 10) or from a tape (Section 6), *after* the DTM program has been loaded.

Table 13-2 Loading DTM Programs from Tape

Auxiliary Interface and RS-232 connection (See Figures 13-1c, 13-1e)	Tape Output Cable (Figure 13-1d)
Select TAPE/DTM	Select TAPE
Tape is under control of Inter-KEY Mode 4.	Tape is manually controlled
If the DTM is already in Mode 4 when you press MONITOR, the tape will start and the DTM program will be loaded. If the DTM is not in Mode 4, the tape will not move until Mode 4 is entered, or the MANUAL START key (CAPTURE MEMORY zone) is pressed.	Enter the tape block number at which the DTM program is located. Mode 4 must be entered before the MONITOR key is pressed.
The DTM-2 will automatically search the tape for the requested program ID code. When the correct ID is found, the block transfer LED on the Inter-KEY will go on. When the program has been loaded, the tape will be stopped automatically. At this point, you may request another program.	As soon as you press MONITOR playback will begin from the block entered on the Parameters 1 menu.

If you wish to see the program listing displayed while the DTM program is being loaded, set up the rest of the 3500 Parameters 1 menu to duplicate the DTM Mode 4 settings (see Figure 13-7).

If you do not care whether the listing is displayed, it is not necessary to change the 3500 parameters selections.

NOTE: When the selected SOURCE is TAPE/DTM, the block number will not be displayed until either Mode 4 is entered or the tape is manually started.

13.8 AUTOMATIC EDITOR: INTER-KEY MODES 5 AND 6

To enable the automatic editor, first select DTM or TAPE/DTM on the 3500 Parameters 1 menu; then press the MONITOR key. The auxiliary interface then becomes active.

Now, you may enter either of the Inter-KEY Editor Modes, Mode 5 or Mode 6. The 3500 will store its present parameter setup and enter the editor mode. When you leave the DTM-2 editor mode, the 3500 will restore its original parameters.

The 3500 is forced to ASCII code for editing operations, regardless of its previous parameter setup. When the 3500 enters Editor Mode, the SYNC characters (shown on the second line of the Monitor Mode display) automatically change to 16 16, although the second line

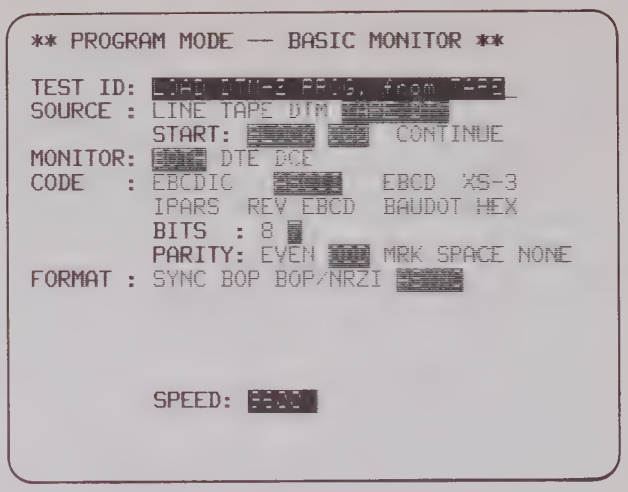

Figure 13-7

still displays the other parameters of the original 3500 program. When the Automatic Editor is disabled, the original synchronization characters are restored automatically.

If the tape is not inserted when the Automatic Editor Mode is entered, the editor menu will be similar to Figure 13-8 or Figure 13-9.

If the tape has already been inserted when the Editor Mode is entered, the 3500 may not display the editor menu.

If the tape is inserted, it is automatically repositioned when the Editor is entered. While repositioning is in progress, the menu is sent to the CRT buffer, but is not displayed. If the tape has been repositioned before the Editor is entered, the Editor menu will be displayed.

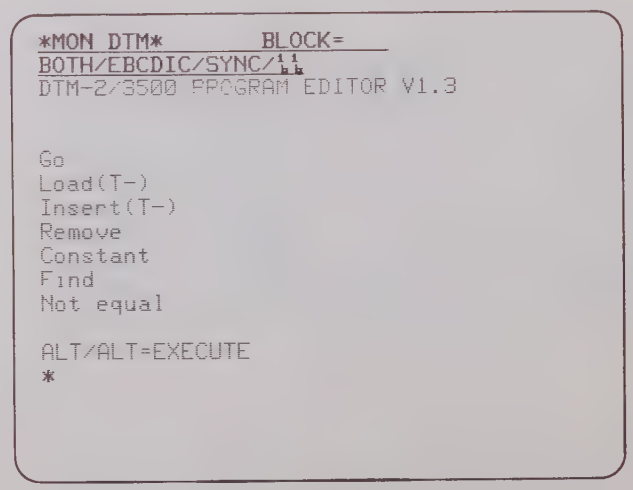

Figure 13-8

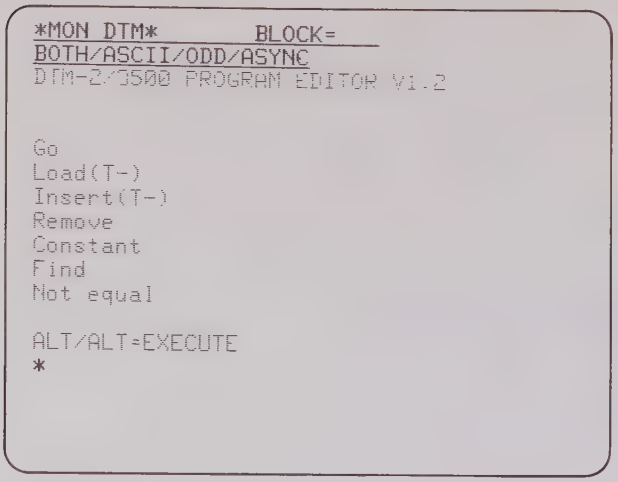

Figure 13-9

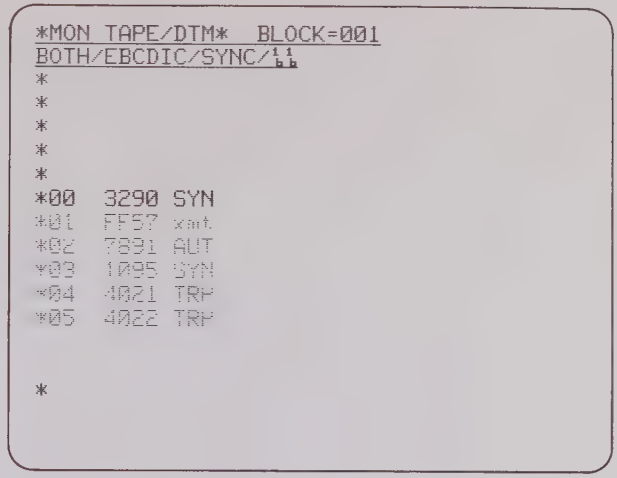

Figure 13-10

In either case, when tape motion has stopped, you may depress the UP arrow key on the Inter-KEY to display the DTM-2 program, starting at Step 00. (Refer to Figure 13-10.)

From this point, you may follow the Inter-KEY Operator's Manual to edit or enter the program.

CAUTION: In the Editor Mode, you should refrain from changing the 3500 parameters. If this should happen, you must reset both the 3500 and the INTERSHAKE before you execute any test. If the units lose synchronization in Editor Mode, reset both units and start over. (The PROGRAM key resets the 3500.)

APPENDIX I
INTERVIEW 3500 Options

I.1 ENHANCED X.25-DLC SOFTWARE (OPTION-895-10-1)

INTERVIEW 3500 Option 895-10-1 is a software package designed for users of Bit-Oriented Protocols that use zero-bit stuffing or transparent BISYNC framing. It adds special frame (level 2) and packet (level 3) protocol display modes, which greatly increase your ability to analyze transmission sequences that have been recorded on tape.

Taped programs are upwardly compatible with this option; i.e., programs that were saved in a standard unit may be loaded into your X.25-DLC Enhanced Software unit. However, programs taped in the modified unit may not be used in a standard unit. Data recorded in either type of unit may be played back in the other.

I.1.1 Parameters 1 Menu. Select TAPE or TAPE/DTM as data source. The only change in the Basic Monitor menu from the standard 3500 is in the FORMAT field. The selections BOP and BOP/NRZI have been replaced by three choices: HDLC, SDLC, and SDLC/NRZI. (See Figure I-1.)

The HDLC selection gives frame and packet protocol display, while SDLC and SDLC/NRZI permit only frame display. Thus, the HDLC frame acronym set given in Table I-1 is oriented toward X.25 and X.75, whereas that shown for the SDLC selections uses IBM SNA-type acronyms. Users of other protocols such as BDLC may select either HDLC or SDLC, depending on which set of acronyms best meets their requirements. Select HDLC for any of the protocols falling under that general category, including X.25 and X.75. As in the standard unit, select SYNC for BISYNC framing. For SDLC, select either SDLC or SDLC/NRZI, the latter for NonReturn to Zero encoding.

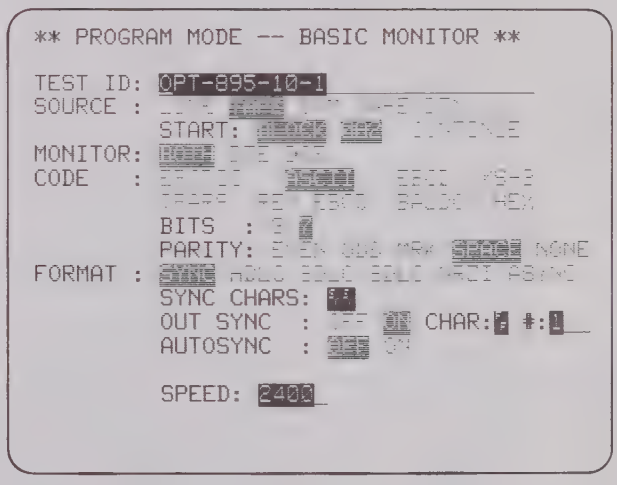

Figure I-1

I.1.2 Parameters 2 Menu.

(a) *DISPLAY MODE.* To display data on the CRT, select either SINGLE or DUAL-LINE mode, just as you would in the standard 3500. Either of these selections enables the same ENHANCE and SUPPRESS fields available in the standard unit.

PACKET and FRAME appear as DISPLAY MODE selections only when TAPE or TAPE/DTM has been selected as SOURCE on the Parameters 1 menu.

Table I-1 OPT-895-10-1 Mnemonics

Table I-1a X.25 Frame Level

Mnemonic	Definition	Binary
INFO	INFOrmation	X X X X X X X 0
RR	Receiver Ready	X X X X 0 0 0 1
RNR	Receiver Not Ready	X X X X 0 1 0 1
REJ	REJect	X X X X 1 0 0 1
SREJ	Selective REJect	X X X X 1 1 0 1
DISC	DISConnect	0 1 0 X 0 0 1 1
UA	Unnumbered Acknowledge	0 1 1 X 0 0 1 1
FRMR	FRaMe Reject	1 0 0 X 0 1 1 1
DM/SARM	Disconnect Mode/Set Asynchronous Response Mode	0 0 0 X 1 1 1 1
SABM	Set Asynchronous Balance Mode	0 0 1 X 1 1 1 1

Table I-1b X.25 Packet Level

Mnemonic	Definition	Binary
DATA	DATA	X X X X X X X 0
RR	Receiver Ready	X X X 0 0 0 0 1
RNR	Receiver Not Ready	X X X 0 0 1 0 1
REJ	REJect	X X X 0 1 0 0 1
SREJ	Selective REJect	X X X 0 1 1 0 1
CALL	CALL	0 0 0 0 1 0 1 1
CALL ACC	CALL ACCept	0 0 0 0 1 1 1 1
CLEAR	CLEAR	0 0 0 1 0 0 1 1
CLEAR C	CLEAR Confirm	0 0 0 1 0 1 1 1
RESET	RESET	0 0 0 1 1 0 1 1
RESET C	RESET Confirm	0 0 0 1 1 1 1 1
INT	INTerrupt	0 0 1 0 0 0 1 1
INT CON	INTerrupt CONfirm	0 0 1 0 0 1 1 1
RSTRT	ReSTaRT	1 1 1 1 1 0 1 1
RSTRT C	ReSTaRT Confirm	1 1 1 1 1 1 1 1

(See Figures I-2 and I-3.) When FRAME or PACKET has been selected, the SUPPRESS and ENHANCE fields disappear.

When you select FRAME or PACKET, data will not be displayed in Monitor Mode. Instead, you will see a sequential display of only frame (level 2) or packet (level 3) protocol. Figures I-4 and I-5 are examples. Two new data-entry fields become available to help you specify which frame or packet types you wish to have expanded.

Table I-1c SDLC

Mnemonic	Definition	Binary
INFO	INFOrmation	X X X X X X X 0
RR	Receiver Ready	X X X X 0 0 0 1
RNR	Receiver Not Ready	X X X X 0 1 0 1
REJ	REJect	X X X X 1 0 0 1
SREJ	Selective REJect	X X X X 1 1 0 1
NSI	Non-Sequenced Information	0 0 0 X 0 0 1 1
NSP	Non-Sequenced Poll	0 0 1 X 0 0 1 1
DISC/RQD	DISConnect/ReQuest Disconnect	0 1 0 X 0 0 1 1
NSA	Non-Sequenced Acknowledge	0 1 1 X 0 0 1 1
SNRM	Set Normal Response Mode	1 0 0 X 0 0 1 1
TEST	link TEST	1 1 1 X 0 0 1 1
SIM/RQI	Set Initialization Mode/ ReQuest Initialization	0 0 0 X 0 1 1 1
RGA	Remote Go-Ahead	0 1 0 X 0 1 1 1
CMDR	CoMmanD Reject	1 0 0 X 0 1 1 1
CFGR	ConFiGuRe	1 1 0 X 0 1 1 1
SARM/ROL	Set Asynchronous Response Mode/Request OnLine	0 0 0 X 1 1 1 1
XID	eXchange station ID	1 0 1 X 1 1 1 1
BCN	BeaCoN	1 1 1 X 1 1 1 1

FRAME. The Monitor Mode display (see Figure I-4) will show the address, frame type, N(R), N(S), and P/F bit value. For HDLC or SDLC, blocks will be identified as Good, Bad, or Aborted by reverse G, B, or A, respectively. (See Figure I-6.) Notice that the B or A symbol is shown in bright reverse image.

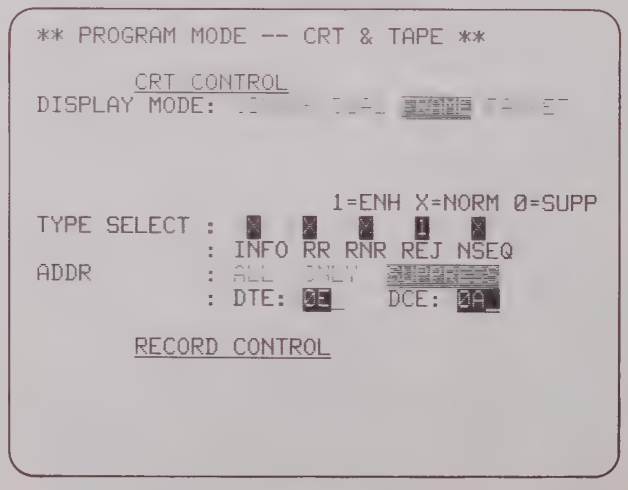

Figure I-2

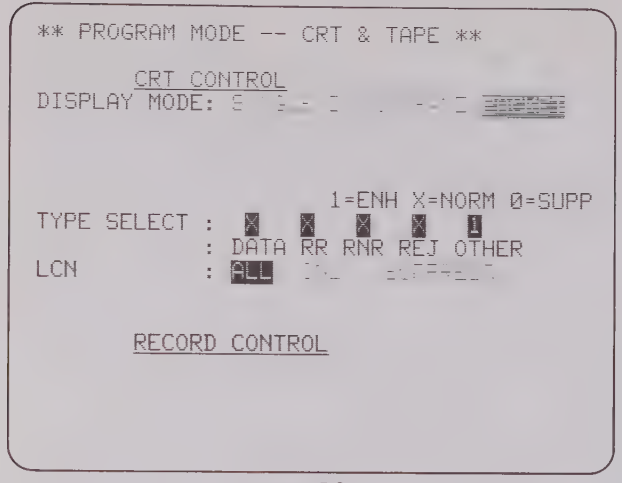
** PROGRAM MODE -- CRT & TAPE **
CRT CONTROL
DISPLAY MODE:
1=ENH X=NORM 0=SUPP
TYPE SELECT : X X X X 1
: DATA RR RNR REJ OTHER
LCN : ALL
RECORD CONTROL

Figure I-3

PACKET. You may select PACKET only if you have selected HDLC or SYNC FORMAT on the Parameters 1 menu. The Monitor Mode display (see Figure I-5) will than show LCN (Logical Channel Number), packet-type mnemonic, P(R), and P(S). Q, D, and M will be displayed when they are ON (bit value = 1). As in the case of the FRAME display, Good, Bad, and Aborted blocks will be identified except in SYNChronous operation.

(b) *TYPE SELECT.* This is a data-entry field that appears upon selection of FRAME or PACKET. (Refer to Figures I-2 and I-3.) The default condition is normal (X) video display of the expansions of the five selections. Enter 1's for any of the frame or packet types to display the selected frames or packets in low-intensity reverse image. Enter 0's to suppress display of any selections.

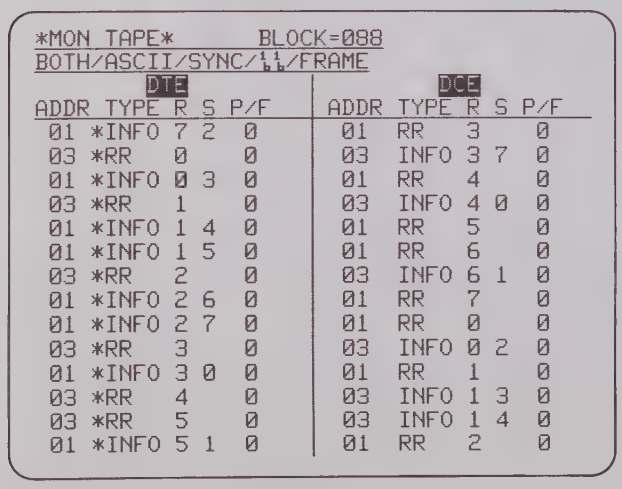
MON TAPE BLOCK=088
BOTH/ASCII/SYNC/1 1/FRAME
DTE
ADDR TYPE R S P/F
01 *INFO 7 2 0
03 *RR 0 0
01 *INFO 0 3 0
03 *RR 1 0
01 *INFO 1 4 0
01 *INFO 1 5 0
03 *RR 2 0
01 *INFO 2 6 0
01 *INFO 2 7 0
03 *RR 3 0
01 *INFO 3 0 0
03 *RR 4 0
03 *RR 5 0
01 *INFO 5 1 0
DCE
ADDR TYPE R S P/F
01 RR 3 0
03 INFO 3 7 0
01 RR 4 0
03 INFO 4 0 0
01 RR 5 0
01 RR 6 0
03 INFO 6 1 0
01 RR 7 0
01 RR 0 0
03 INFO 0 2 0
01 RR 1 0
03 INFO 1 3 0
03 INFO 1 4 0
01 RR 2 0

Figure I-4

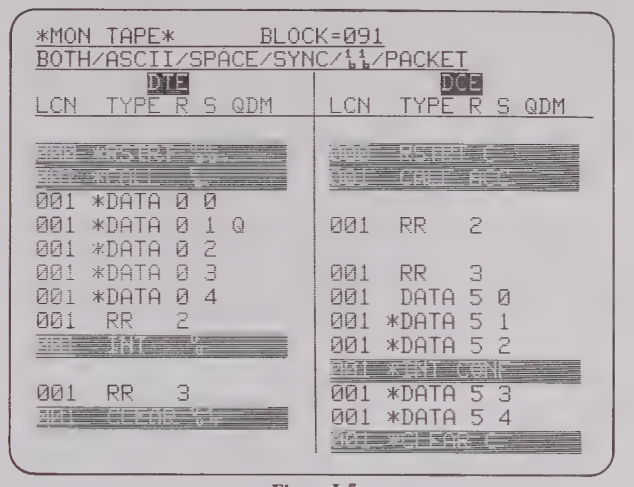

Figure I-5

For FRAME, the selections are INFO, RR, RNR, REJ, and NSEQ (see Figure I-2). For PACKET, they are DATA, RR, RNR, REJ, and OTHER (as shown in Figure I-3).

(c) *ADDR or LCN.* The ADDRess or LCN field appears on the next line only when FRAME or PACKET, respectively, has been selected in the DISPLAY MODE field. There are two fields for this selection. (See Figures I-2 and I-3.) The first line is a data-selection field. For the default selection ALL, mnemonic expansions for all traffic are displayed. If you select ONLY, only the traffic for the addresses or LCNs entered on the next line (see Figure I-7) will be displayed. SUPPRESS prevents display of mnemonic expansions for the addresses or LCNs entered on the next line.

On the next line, enter the addresses or logical channel numbers in which you are interested in both the DCE and DTE fields. When these fields are displayed

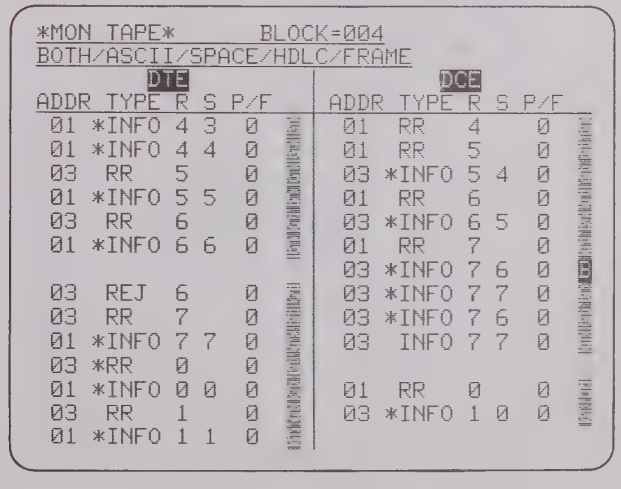
MON TAPE BLOCK=004
BOTH/ASCII/SPACE/HDLC/FRAME
DTE
ADDR TYPE R S P/F
01 *INFO 4 3 0
01 *INFO 4 4 0
03 RR 5 0
01 *INFO 5 5 0
03 RR 6 0
01 *INFO 6 6 0
03 REJ 6 0
03 RR 7 0
01 *INFO 7 7 0
03 *RR 0 0
01 *INFO 0 0 0
03 RR 1 0
01 *INFO 1 1 0
DCE
ADDR TYPE R S P/F
01 RR 4 0
01 RR 5 0
03 *INFO 5 4 0
01 RR 6 0
03 *INFO 6 5 0
01 RR 7 0
03 *INFO 7 6 0
03 *INFO 7 7 0
03 *INFO 7 6 0
03 INFO 7 7 0
01 RR 0 0
03 *INFO 1 0 0

Figure I-6

```
** PROGRAM MODE -- CRT & TAPE **

       CRT CONTROL
DISPLAY MODE: SINGLE DUAL FRAME PACKET



                          1=ENH X=NORM 0=SUPP
TYPE SELECT :  _   _   _   _   _
            : INFO RR RNR REJ NSEQ
ADDR        : ALL  ONLY  SUPPRESS
            : DTE: ___   DCE: ___

       RECORD CONTROL
```

Figure I-7

you must make entries for both sides of the circuit; where there is no entry the selection will default to 0. If you have selected FRAME on the DISPLAY MODE line above, enter two-digit hexadecimal frame-level addresses. If you have selected PACKET above, enter the logical channel numbers in hexadecimal (three digits), as shown in Figure I-8.

NOTE: You simply enter the hexadecimal digits directly from the keyboard. The HEX key is invalid in the ADDR or LCN field.

I.1.3 Triggers. When FRAME or PACKET has been selected for display mode on the Parameters 2 menu, no trigger CRT enhancements except Clear CRT and CRT Freeze should be programmed.

```
** PROGRAM MODE -- CRT & TAPE **

       CRT CONTROL
DISPLAY MODE: SINGLE DUAL FRAME PACKET



                          1=ENH X=NORM 0=SUPP
TYPE SELECT :  _   _   _   _   1
            : DATA RR RNR REJ OTHER
LCN         : ALL  ONLY  SUPPRESS
            : DTE: 004   DCE: 000

       RECORD CONTROL
```

Figure I-8

I.1.4. Monitor Mode. Frame or packet protocol—depending on the Parameters 2 menu selection—will be listed in two columns, DTE on the left, and DCE on the right (see Figures I-4 and I-5). As new frames are received, the display scrolls up, so the oldest received frames are at the top of the screen. If multiple frames are received on one side of the line, then spaces are inserted on the other side to maintain time correlation between TD and RD. If two frames or packets are received at about the same time, they are displayed on the same line. An asterisk precedes the control-type mnemonic of the frame or packet that was received first.

In the frame display, the address, control type, N(R) and N(S) counts, and P/F bit status are displayed. In the packet display the LCN, packet type, P(R) and P(S) counts, and Q, D, and M bit status are displayed. In some nonsequenced packet types there are additional bytes of interest. In these cases, since there are no P(R) or P(S) counts, the space reserved for P(R) and P(S) is used to display the additional causing characters in hexadecimal. For CALL and INTERRUPT packets, one additional byte is displayed (Octet 4), and for CLEAR, RESET, RESTART, and DIAGNOSTIC packets, two extra bytes (Octets 4 and 5) are shown (see Figure I-5, for example).

The Parameters 2 selections shown in Figure I-2 would produce the frame display of Figure I-9. Notice that the REJect line is reverse-image enhanced. The packet display of Figure I-5 shows the progression of a call setup at the packet level with the supervisory packets enhanced. Figure I-10 is an example of SDLC protocol display.

```
*MON TAPE*          BLOCK=004
BOTH/ASCII/SPACE/HDLC/FRAME
          DTE                          DCE
ADDR TYPE  R S P/F          ADDR TYPE  R S P/F
 01 *INFO 4 3  0             01  RR   4    0
 01 *INFO 4 4  0             01  RR   5    0
 03  RR   5    0             03 *INFO 5 4  0
 01 *INFO 5 5  0             01  RR   6    0
 03  RR   6    0             03 *INFO 6 5  0
 01 *INFO 6 6  0             01  RR   7    0
                             03 *INFO 7 6  0  B
 03  REJ  6    0             03 *INFO 7 7  0
 03  RR   7    0             03 *INFO 7 6  0
 01 *INFO 7 7  0             03  INFO 7 7  0
 03 *RR   0    0
 01 *INFO 0 0  0             01  RR   0    0
 03  RR   1    0             03 *INFO 1 0  0
 01 *INFO 1 1  0             01  RR   2    0
```

Figure I-9

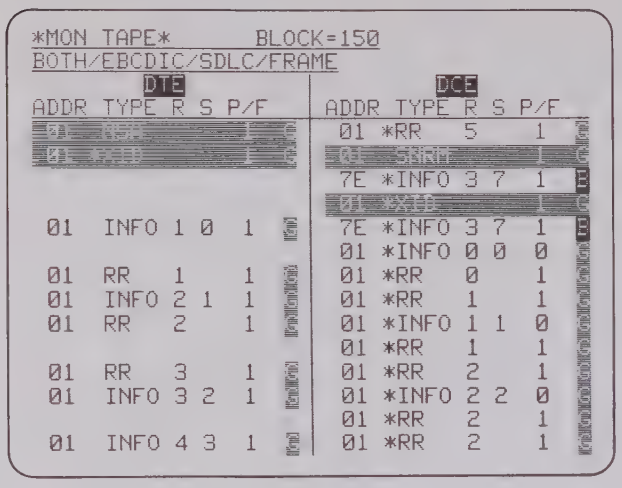
MON TAPE BLOCK=150
BOTH/EBCDIC/SDLC/FRAME
DTE
ADDR TYPE R S P/F
01 INFO 1 0 1
01 RR 1 1
01 INFO 2 1 1
01 RR 2 1
01 RR 3 1
01 INFO 3 2 1
01 INFO 4 3 1
DCE
ADDR TYPE R S P/F
01 *RR 5 1
7E *INFO 3 7 1
01 *INFO 3 7 1
01 *INFO 0 0 0
01 *RR 0 1
01 *RR 1 1
01 *INFO 1 1 0
01 *RR 1 1
01 *RR 2 1
01 *INFO 2 2 0
01 *RR 2 1
01 *RR 2 1

Figure 1-10

You can vary playback speed using the UP and DOWN cursor arrows in the same way as when data is displayed. When the display is frozen, you can scroll through the buffer using the B, E, and cursor keys. Although the display appears to be real time up to 9600 bps, it is not designed to be used on line.

Table I-1 lists the frame and packet mnemonics displayed by OPT-895-10-1.

NOTE: When OPT-895-10-1 has been installed, the list of mnemonics given in Tables 9-1 and 9-2 for the automatic frame and packet locators is no longer valid. The frame and packet locators will display the mnemonics listed in Table I-1.

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TECHNICAL MANUAL

for

INTERVIEW® 3000 and 3500

Atlantic Research Corporation Teleproducts Division
5390 Cherokee Avenue, Alexandria, Virginia 22314

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Issue 1, April 1980

TECHNICAL MANUAL

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5390 Cherokee Avenue, Alexandria, Virginia 22314

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Notice

This technical manual applies to the Series B INTERVIEW 3000 and 3500. Displays and menus described herein correspond to Software Release V3.02, but the text is applicable to all earlier releases.

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Subject Index

1 Introduction

Because this manual is intended as a technical reference, the material must be arranged by topic. Nevertheless, some users may wish to orient themselves by reading the entire manual, so we have chosen a sequence compatible with that purpose.

A subject index is provided to increase reference efficiency.

Section 2 is an overall view of the instrument to give you an idea of how the various topics relate to the whole.

Section 3, Before Power-up, includes information needed by the new user, but you should also consult it when a unit is connected to a new power source or data line.

In Sections 4 and 5, Status Indicators and Keyboard, you can survey two features with which you interact with the instrument: These two sections will take on more significance, and you will probably find yourself referring to them in more depth, after you have developed a basic familiarity with the instrument.

Section 6 enables you to power up your unit for monitoring either line data or taped data. You probably have a tape containing both program and data. In that case, you will be able to go directly from Power-up (Section 6) to Sections 8 and 9 and thus become acquainted with the unit's Monitor Mode capabilities before you need consider the Program Mode sections (10 and 11).

If you have BISYNC data, whether line or tape, you may take a slightly different path, going from Section 6 to Section 7 (BISYNC Default Program) before reading Sections 8 and 9.

If you do not have a tape or BISYNC data, you should go from Section 6 to Section 10 to learn how to select basic parameters before you consider the Monitor Mode (Sections 8 and 9).

Programming is covered in Sections 10 and 11. Section 10 explains how to select all the basic parameters necessary to monitor data. Section 11 gives instructions for using triggers to develop applications programs.

Essential information for several specialized topics has been gathered in separate sections: Recording (Section 12), interactive operation with INTERSHAKE II (DTM-2) (Section 13), monitoring and programming for bit-oriented protocols (Sections 9.7 and 14), and counting parity errors (Section 11.6). Further technical and service information may be found in Sections 15-17 and the appendixes.

This manual covers both the INTERVIEW 3000 and the 3500. The only difference between the two is that the 3500 has an integral tape. The 3000 user may find it efficient to mark the following sections because they concern only the tape: 3.4.2, 4.2.3, 5.5, 6.2, 6.4, 6.5.1, 7.3, 8.4.3, 8.6, columns 4 and 5 of Table 8-1, 9.3, 10.2.5, 10.5, 11.2.2, 12, 13.3, 15.2, 16.4, 16.5.2, 16.7, and Appendix C.

There are three training manuals for use with the INTERVIEW 3500: BISYNC, ASYNC, and X.25-SDLC. They are essentially programmed learning courses. Using one of the training manuals and its companion training tape, one can learn to operate the unit in a few hours. We urge each new operator to introduce himself to the equipment through at least one of the self-training courses. The knowledge gained from the training manual can be expanded using this technical manual. Table 1-1 is a brief description of the Training Manuals.

The training manuals can also be used with the INTERVIEW 3000. Study the illustrations in the training manual as you go through it; then compare them with your own data.

Many of the illustrations in this technical manual are video prints from the 3500 CRT. We have used negative images because they give much better reproduction on the printed page.

Table 1-1
INTERVIEW 3500 Training Manual Content

Topic	BISYNC Man.	X.25-SDLC Man.	ASYNC Man.	Tech. Man. (Section)
Single-line display	✓	✓	✓	8.4
Dual-line display	—	✓	—	8.4
Preformatting tapes	—	—	—	12.1
Character enhancement	✓	✓	✓	10.4.3
RS-232/V.24 lead status enhancement	—	—	✓	10.4.4
Suppressing characters	✓	✓	✓	10.4.2
Suppressing a Bit Mask	—	✓	—	10.4.2
SYNC character entry	✓	✓	—	10.2.9
Trigger freeze control of CRT (selective display)	—	✓	—	11.2
Trigger control of CRT enhancements	✓	✓	—	11.2
Trigger control of tape	—	—	✓	11.2, 12.3.4
RS-232/V.24 lead trigger conditions	—	—	✓	11.1.2
Recording RS-232/V.24 lead status	—	—	✓	10.5
Counters, network performance measurements	✓	✓	✓	11.2.5
Timers, network/data measurements	✓	✓	—	11.2.4
Timers, control lead/data measurements	—	—	✓	11.1.2, 11.2.4
Outputting signals from 3500	—	—	—	15
Interactive operation with INTERSHAKE II	—	—	—	13

2 General Description

The INTERVIEW 3500 is really three independent instruments in one (see Figure 2-1)—

- A simple real-time data display that the operator can control from the keyboard. Selected data can be highlighted or suppressed. Results can be seen or the program reviewed without interrupting data reception or program operation.
- A programmable diagnostic analyzer for network performance measurements. Counters and timers are controlled by eight nonsequential triggers that also control the CRT and recorder.
- An automatically controlled integral tape that stores both program and data, as well as RS-232/V.24 interface lead status.

The INTERVIEW is programmed via self-teaching menus. When you power up the unit, it leads you through all the necessary steps, offering only the required relevant parameter choices. There is no need for you to be a programmer.

2.1 SYSTEM ARCHITECTURE

The INTERVIEW 3500 contains three Z-80 microprocessors. Each microprocessor operates independently and is supported with its own ROM, RAM, and input-output interface.

Most of the firmware is dedicated to the human interface tasks associated with the keyboard, CRT menus, and status indicators.

Simplicity of operation is further achieved by assigning each microprocessor independent tasks: One controls the CRT display and keyboard; the second is actively looking for triggers and handling the real-time statistical performance monitoring operations; and the third controls the tape.

Although the logical power of the three microprocessors controls the CRT, counters and timers, and tape, the operator may at any time override the program by using the keyboard (without stopping the test and entering the program mode).

2.2 SERIAL DATA INTERFACE

Serial signals are obtained from one of three sources: line (RS-232/V.24), tape playback, or DTM (INTERSHAKE).

Line signals are received by the separate TD and RD serial receivers feeding the logic. Separate TD and RD serial receivers are provided for recording onto tape.

Asychronous signals are recovered by use of a software-controlled clock. The operator selects the clock speed by entering up to 5 digits.

Synchronous signals are usually recovered by using the external system-supplied clock of the circuit being monitored. The operator may select internal clock recovery where the circuit clock being monitored is deficient. In this case the clock speed must be entered by the operator.

Bit-oriented protocol signals are suitably processed via "zero destuffing" logic, common to all HDLC framing standards. NRZI logic is available for SDLC circuits. Either external or internal clock can be used.

Tape signals are recovered on playback by using the internal clock to determine the playback speed up to 9.6 kbps.

One standard RS-232/V.24 male and one female DB-25 connector are provided on the rear of the unit. These connectors are wired together to enable the INTERVIEW unit to access a circuit when connected in series between the modem and the terminal. This also allows connection through a single 5-foot T cable supplied with the unit.

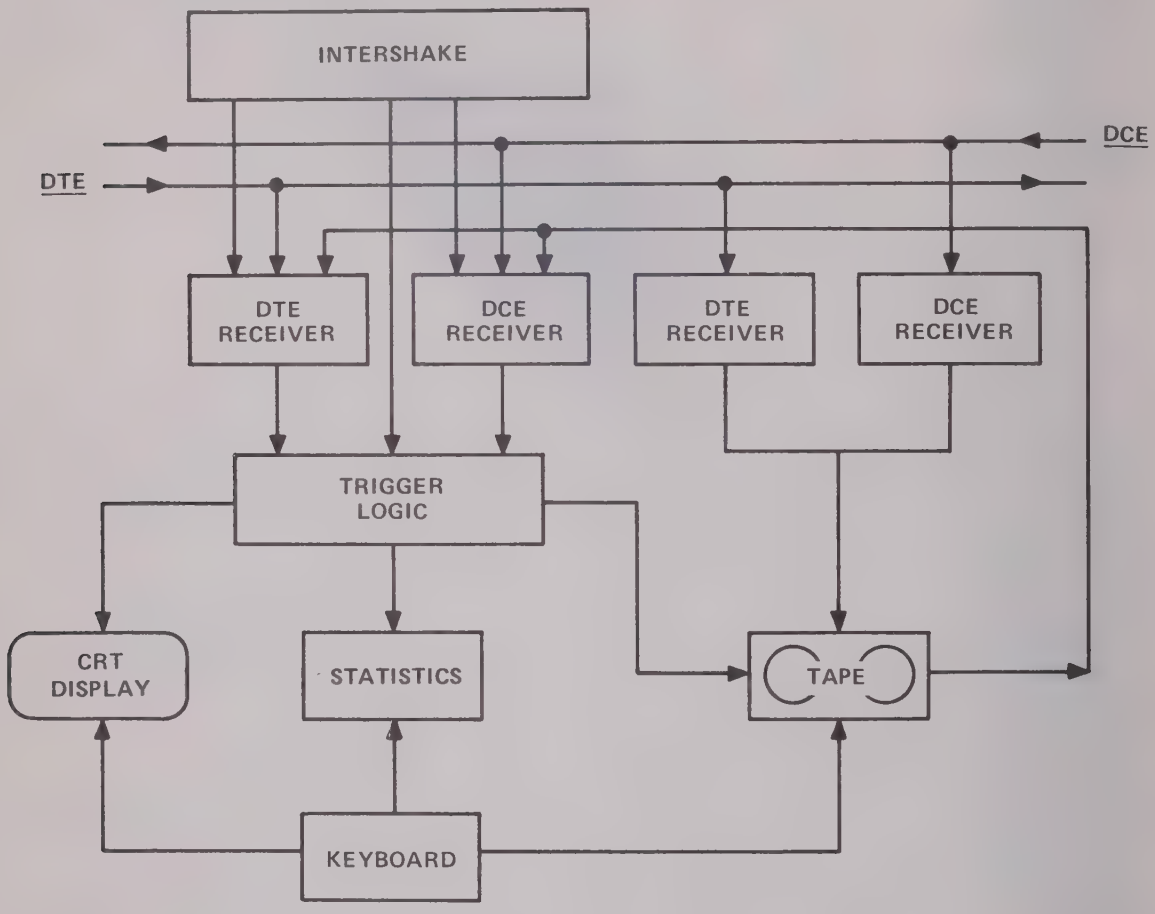

Figure 2-1 Block Diagram of INTERVIEW 3500

3 Before Power-Up

3.1 UNPACKING

As each item is unpacked from the carton, inspect it for obvious mechanical damage. Check the pockets in the packing caps for cables, manuals, and so forth. Retain the original packing material for future reshipment, as it has been designed for maximum protection.

Check the received items against the shipping list. The basic shipping list for each unit includes an Operator's Guide, a three-ring binder containing other 3000 Series documentation, an RS-232/V.24 ribbon cable, and a power cord. In addition, all 3500 units are shipped with three training tapes and a blank tape. If you have ordered options, some other items may be included in the carton.

CAUTION: Do not connect the INTERVIEW to power until you have checked the line voltage selector in accordance with Section 3.2.1.

3.2 ELECTRICAL SETTINGS

3.2.1 Voltage Selector. The voltage selector is part of the power connector on the right side of the rear panel of the instrument. (See Figure 3-1.) Slide the transparent window to the left. The line voltage selector card can be seen at the bottom of the window with the present voltage selection visible—and right side up.

The 3000 Series INTERVIEW is designed to operate at 95 to 130 V AC, 50 or 60 Hz when the unit is set for 115; or from 190 to 260 V AC, 50 or 60 Hz when it is set for 230. (*Note:* the frequency must be selected separately.)

To change the line voltage selection, remove the fuse by swinging the fuse extractor handle labeled FUSE PULL out toward the left. The voltage selector card can then be removed and rotated so that the correct line voltage is visible in the window. When the voltage selector card has been seated correctly, rotate the fuse extractor handle to the right and in, and replace the fuse.

3.2.2 Internal Switches. Internal switches provide a choice between 50- and 60-Hz operation, and between RS-232/V.24 and MIL-188 signal reception. These are factory-set for the customer's environment. If the unit should fail to operate properly, please consult Section 16 for detailed instructions on these settings.

3.3 SETUP

Slide the window on the power connector to the right to expose the connector pins, and connect the power cord to the INTERVIEW.

Rotate the handle to the position shown in Figure 3-2 by pressing inward on the handle pivots while you rotate the handle. Release pressure on the pivots and, if necessary, move the handle until the handle detents lock in place.

Open the front panel by lifting up the rear edge of the black latch.

WARNING: Be sure to connect the INTERVIEW only to a properly grounded power source.

Connect the power cord to a third-wire ground power source. The power cord supplied has a third protective ground wire connected to the chassis.

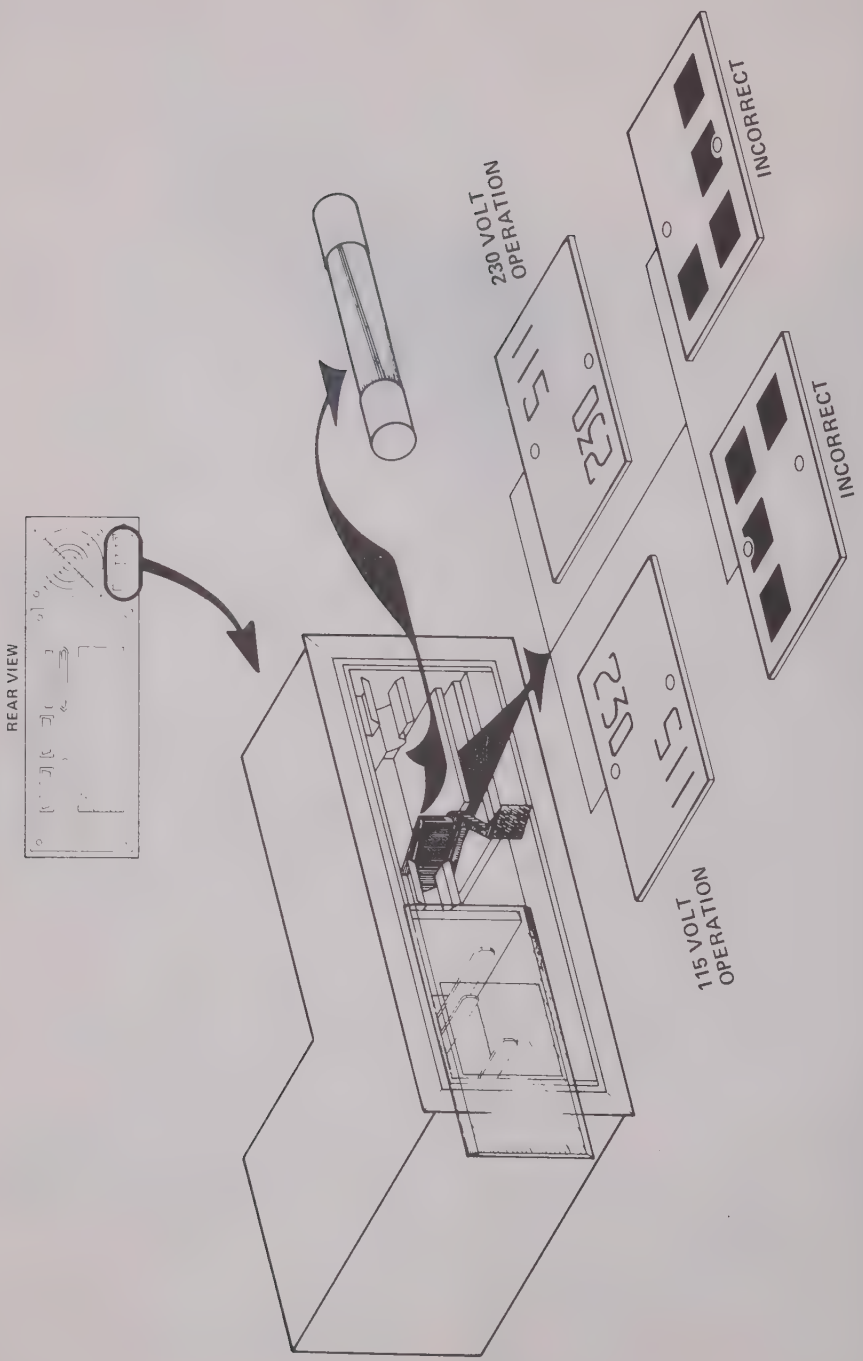

Figure 3-1 Line voltage selector card

CAUTION: When you power up the instrument (Section 6), be sure that the fan in the rear runs.

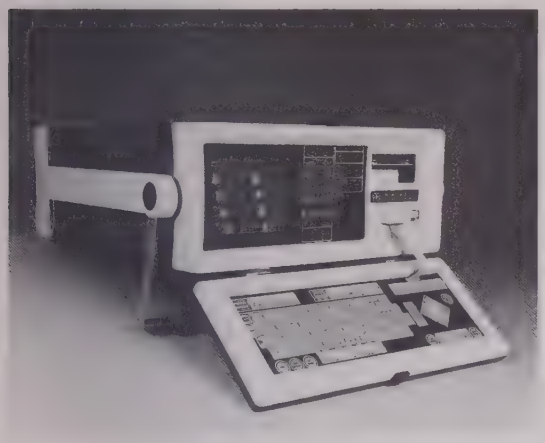

Figure 3-2

3.4 DATA SOURCE CONNECTION

3.4.1 Line Source. One standard RS-232/V.24 male and one female DB-25 connector are provided on the rear of the unit. These connectors are wired together to enable the INTERVIEW unit to access a circuit when connected in series between the modem and the terminal. This also allows connection through a single 5-foot T cable supplied with the unit. If you wish, you may connect the unit via your patch system.. (See Figure 3-3 for some suggested configurations.)

3.4.2 Tape Source. To use the 3500's integral tape as the data source, see Sections 6.2-6.5.

3.4.3 Operation with INTERSHAKE. See Section 13.

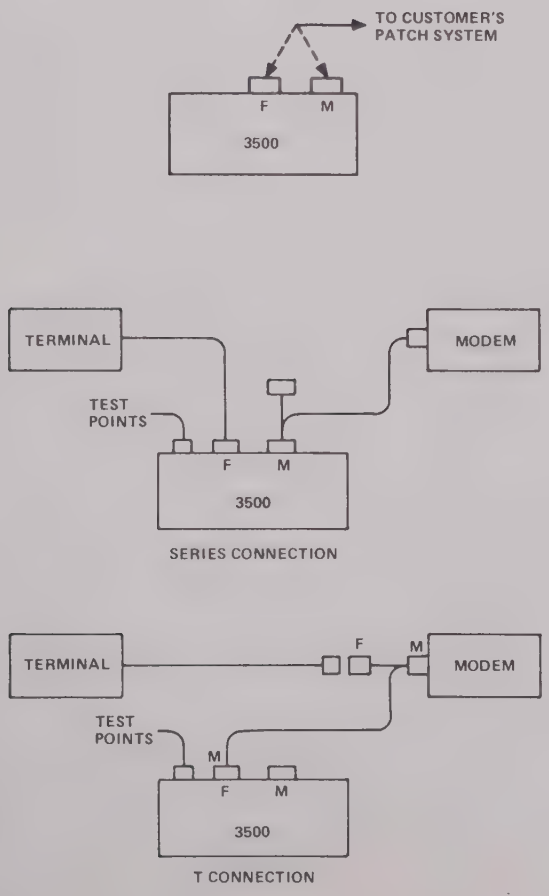

Figure 3-3 Suggested data line connections

4 Status Indicators

Light-Emitting Diode (LED) status indicators are provided on the front of the INTERVIEW. The left side of the status panel, headed EIA STATUS, displays the status of the data and control leads in the RS-232/V.24 interface. The right side includes the indicators for the data receivers, CRT, and Capture Memory.

4.1 EIA STATUS

Indicators are specifically provided for 17 data, clock, and control leads. In addition, there is an indicator for Pin 11 and one other, labeled U/A (STRAP on the program menus), that can be assigned by the user to any lead desired (see Tables 4-1 and 4-2). Thus, the status of all data, clock and control leads defined by the EIA RS-232C standard can be observed.

The EIA STATUS display (Figure 4-1) is arranged to identify the source of each signal and to group corresponding signals. In the left-hand column, headed DTE (Data Terminal Equipment), are the indicators for signals from the DTE; in the right-hand column, headed DCE (Data Communication Equipment), the indicators for signals from the DCE.

Below these headings the indicators are grouped logically by function, as explained in Table 4-1.

The EIA status LEDs are ON for input voltages greater than approximately +3V; that is, for a control lead in the ON state or a data lead in the space state. When the data source is line, they are all active. When the source is tape, and EIA status has been recorded, the TD, RD, DTR, DSR, RTS, CTS, RI, RLSD, SCT, SCR, and U/A (STRAP) LEDs are active; but if EIA status has not been recorded, then only TD, RD, SCT, and SCR are active.

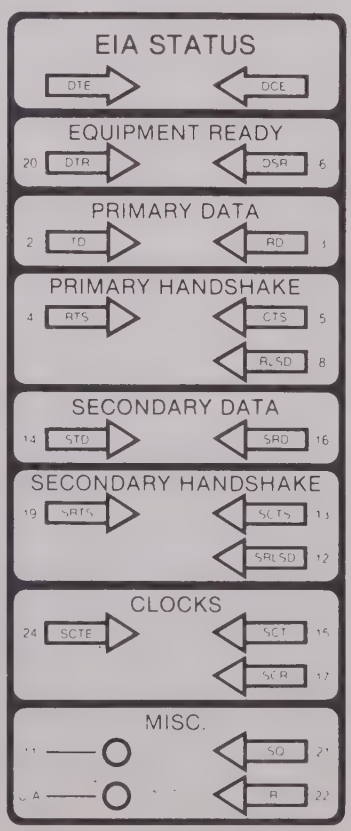

Figure 4-1 EIA status display

Table 4-1
EIA Status Panel

DTE	DCE
EQUIPMENT READY Group	
Pin 20, DTR: Data Terminal Ready EIA = CD CCITT = 108.2	*Pin 6,* DSR: Data Set Ready EIA = CC CCITT = 107
PRIMARY DATA Group	
Pin 2, TD: Transmitted Data EIA = BA CCITT = 103	*Pin 3,* RD: Received Data EIA = BB CCITT = 104
PRIMARY HANDSHAKE Group	
Pin 4, RTS: Request to Send EIA = CA CCITT = 105	*Pin 5,* CTS: Clear to Send EIA = CB CCITT = 106
	Pin 8, RLSD: Received Line Signal Detect (Carrier Detect) EIA = CF CCITT = 109
SECONDARY DATA Group	
Pin 14, STD: Secondary Transmitted Data EIA = SBA CCITT = 118	*Pin 16,* SRD: Secondary Received Data EIA = SBB CCITT = 119
SECONDARY HANDSHAKE Group	
Pin 19, SRTS: Secondary Request to Send EIA = SCA CCITT = 120	*Pin 13,* SCTS: Secondary Clear to Send EIA = SCB CCITT = 121
	Pin 12, SRLSD: Secondary Received Line Signal Detect EIA = SCF CCITT = 122
CLOCKS Group	
Pin 24, SCTE: Serial Clock Terminal Source EIA = DA CCITT = 113	*Pin 15,* SCT: Serial Clock Transmit EIA = DB CCITT = 114
	Pin 17, SCR: Serial Clock Receive EIA = DD CCITT = 115
MISC. Group	
Pin 11: Originate Mode EIA = CY CCITT = 126/127 Select transmit frequency or select receive frequency; used in BELL 103F-Type Data Sets.	*Pin 21,* SQ: Signal Quality Detector EIA = CG CCITT = 110
	Pin 22, RI: Ring Indicator EIA = CE CCITT = 125
U/A: User Assigned May be connected by the user to any desired control lead. (See Table 4-2 for strapping instructions.) Thus, not only may a control lead with no permanent indicator be assigned a LED, but also its status may be used to reverse-image enhance data on the CRT (see Section 10.4.4). If interface status is recorded, the status of the U/A indicator will be recorded and displayed during playback.	

Table 4-2
Line Interface Module Strapping
for User-Assigned EIA Status Indicator

EIA Pin	Connect TP*† 14 (Common Pin) to
9	TP 1
10	TP 2
11	TP 3
12	TP 4
13	TP 5
14	TP 6
16	TP 7
18	TP 8
19	TP 9
21	TP 10
23	TP 11
24	TP 12
25	TP 13

** CAUTION: Never connect TP 14 to more than one other test point.*

† To access test points, loosen the four captive fasteners on the rear panel of the unit. Pull out the panel and its attached board, sliding it in parallel with the top cover. Wire-wrap TP 14 to the desired test point using 28- or 30-gage insulated wire. (Locations of the test points are shown on Figure 16-3.)

4.2 INTERVIEW STATUS

There are INTERVIEW STATUS Indicators for RECEIVERS, the CRT, and the CAPTURE MEMORY (the 3500 tape). (See Figure 4-2.)

4.2.1 RECEIVER IN SYNC. The RECEIVER IN SYNC LEDs, labeled TD for Transmitted Data and RD for Received Data, are ON when their respective receivers are "in sync" while monitoring synchronous or bit-oriented protocols. For example, the appropriate indicator is turned on when the *synchronization character* sequence is encountered in synchronous protocols and remains on until *OUTSYNC* (Section 10.2.10) is encountered. (NOTE: These LEDs do not indicate status of the separate receivers for the tape.) It is possible for the receivers to be in synchronization and *not be updating* the data on the CRT because the display has been frozen (see Section 9) or the data is suppressed (see Section 10.4.2).

The RECEIVER IN SYNC indicators are OFF when asynchronous protocols are being monitored.

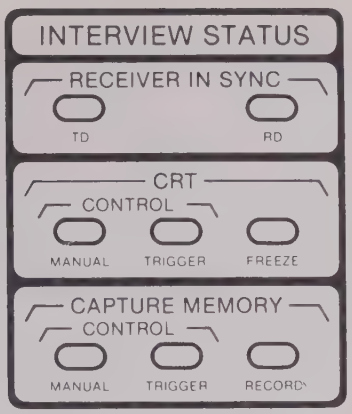

Figure 4-2 INTERVIEW status display

4.2.2 CRT. There are three indicators to display the status of the CRT control logic.

(1) *TRIGGER CONTROL.* When the trigger LED is ON, the real-time CRT display is stopped (frozen) or started (unfrozen) by triggers (see Section 11). This is the default condition when the Monitor Mode is entered, even if no triggers are utilized.

(2) *MANUAL CONTROL* When the MANUAL indicator is ON, the CRT display is under manual control and has been stopped or started using the MANUAL FREEZE or MANUAL UNFREEZE key. These manual keys override trigger control until the RESUME TRIGGER key is operated. Leaving Monitor Mode cancels manual control.

(3) *FREEZE.* When the FREEZE LED is ON the real-time CRT display has been stopped (frozen) and no new data is being added to the display. This may be the result of either a manual action or a trigger action as indicated by the MANUAL or TRIGGER CONTROL indicator.

4.2.3 CAPTURE MEMORY (tape). There are three LEDs to display the status of the Capture Memory or tape control logic. The Capture Memory indicators operate in much the same manner as the CRT indicators.

The Capture Memory is separate from and should not be confused with the CRT Display Buffer.

(1) *TRIGGER.* TRIGGER CONTROL LED is ON when the Capture Memory is being started and stopped by triggers (see Section 11). This is the default condition when the Monitor Mode is entered, even if no triggers are utilized.

(2) *MANUAL.* When the MANUAL CONTROL indicator is on, the Capture Memory has been

started or stopped using the MANUAL START or MANUAL STOP key and is now under manual control. These manual keys override the trigger controls until the RESUME TRIGGER key is operated. Leaving Monitor Mode also cancels manual control.

(3) *RECORD.* The RECORD indicator is ON when data is being entered in the Capture Memory. This may be the result of a manual action or a trigger action, as indicated by the MANUAL or TRIGGER CONTROL indicator, or it may be the result of the initial Record Control condition selected in the Parameters 2 menu (see Section 10.5). If no selections have been made on the Parameters 2 (Record Control) menu, the default condition of the Capture Memory when the Monitor Mode is entered is NOT RECORD, and the RECORD indicator is OFF.

Note: The RECORD LED *does not* necessarily indicate that the tape is moving. The cartridge recorder uses a buffered recording technique to make maximum use of the tape by recording at the highest allowable density. The tape only moves when data is being transferred from the buffer to the tape. At low data rates, the tape may remain stationary for several minutes at a time while the buffer is being filled. The RECORD LED indicates that data is being entered into the record buffer.

5 Keyboard

This section is organized by key, rather than by function. It is intended as a reference source, rather than a procedural instruction. The operator can use it to gain overall familiarity with the keyboard, and should turn to it whenever he encounters unexpected reactions. A diagram of the keyboard is included as Figure 5-1.

5.1 INTRODUCTION

On the touch-sensitive keyboard, key functions are indicated by grouping and color. Many keys are valid in several modes, but the colors indicate their primary functions.

Red keys are primarily Program Mode keys; green keys, Monitor Mode. The two rectangular keys are the mode entry keys: Pressing the red rectangular key (PROGRAM) enables all the other red keys; pressing the green rectangular key (MONITOR) enables all green keys.

A single audible "beep" confirms proper key actions. A displayed message, KEY ERROR, accompanied by a series of "beeps," calls attention to illegal key use.

Keyboard translation tables for the eight codes standard in the 3000 Series INTERVIEW are included as Appendix A.

Key	Program Mode	Monitor (Real-time)	Monitor (Freeze)

5.2 RED KEYS: PROGRAM MODE

PROGRAM	Places unit in Program Mode, enables all red program keys, and displays the basic Program Selections menu.		
PARAMETERS	PARAMETERS followed by 1 selects Basic Monitor menu.	Invalid	Invalid
	PARAMETERS followed by 2 selects CRT & Tape menu and Speaker control.		
TRIGGER	Selects Trigger Summary menu.	Invalid	Invalid
	TRIGGER followed by any number from 1 to 8 selects the corresponding specific trigger menu.		
STATISTICS	Selects Counter and Timer menu.	Invalid	Invalid

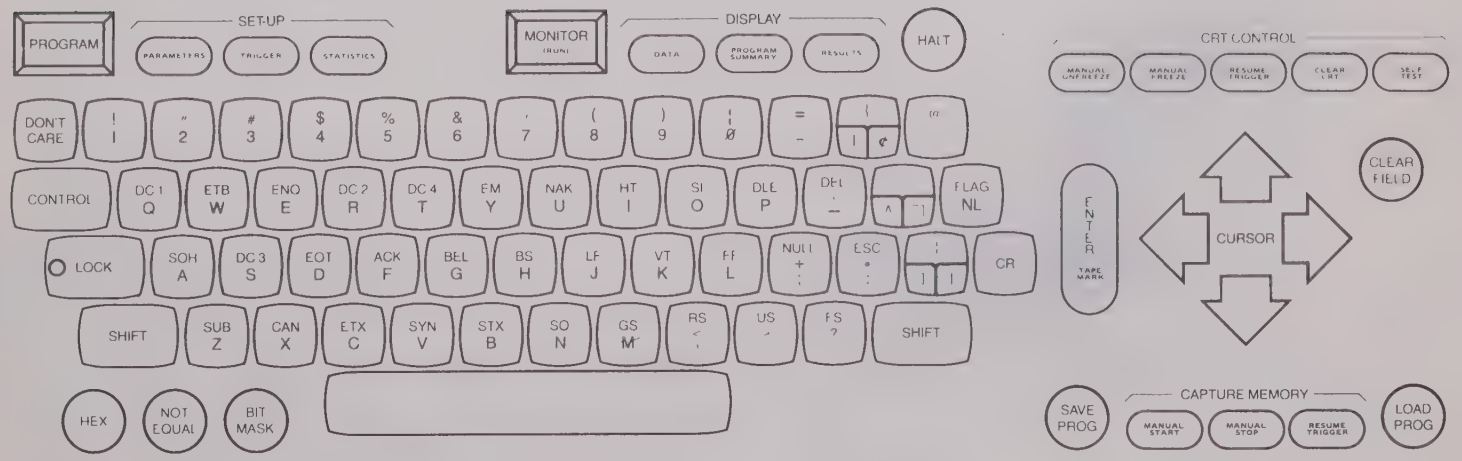
PROGRAM
SET-UP
PARAMETERS
TRIGGER
STATISTICS
MONITOR
(RUN)
DISPLAY
DATA
PROGRAM SUMMARY
RESULTS
HALT
CRT CONTROL
MANUAL UNFREEZE
MANUAL FREEZE
RESUME TRIGGER
CLEAR CRT
SELF TEST
DON'T CARE
CONTROL
LOCK
SHIFT
HEX
NOT EQUAL
BIT MASK
FLAG NL
CR
SHIFT
ENTER
TAPE MARK
CURSOR
CLEAR FIELD
SAVE PROG
CAPTURE MEMORY
MANUAL START
MANUAL STOP
RESUME TRIGGER
LOAD PROG

Figure 5-1

Key	Program Mode	Monitor (Real-time)	Monitor (Freeze)
CLEAR FIELD	Clears any "typed in" entries in current data field. To clear any displayed menu to its power-up default values, operate CONTROL plus CLEAR FIELD simultaneously. To clear from cursor location to the end of current data field, operate SHIFT plus CLEAR FIELD simultaneously.	Invalid	Invalid
CURSOR	When a cursor arrow is held down, after a brief delay the cursor will move continuously until the key is released or until it may no longer logically move in that direction.		
	UP or DOWN arrow moves the cursor up or down to the current selection in first field on the next line, or to first position in field, if choices are to be typed in. (See also ENTER key.)	In tape playback mode, each operation of UP arrow doubles playback speed to max. 9.6 kbps; each operation of DOWN arrow halves speed to min. 14 bps.	*Note:* When display is frozen, cursor will be at last character of the new data. UP or DOWN arrow moves the cursor up or down to the next line. At top or bottom of CRT window, pulls the next line from the buffer onto the display.
	RIGHT (or LEFT) arrow moves the cursor right (or left) to the next permitted selection or to next field. (See also ENTER key.)	RIGHT and LEFT arrows invalid.	RIGHT (or LEFT) arrow moves the cursor right (or left) to the next character or beginning (or end) of next (or preceding) line. (Cursor "wraps around" left and right boundaries.
	Use CONTROL plus CURSOR simultaneously to move cursor directly to last field or selection in cursor arrow direction.	CONTROL plus CURSOR invalid.	CONTROL plus CURSOR invalid.
ENTER	Always advances the cursor to the next field, whether to the right or down.	If data source is TAPE, ENTER is invalid. If data source is LINE or DTM, ENTER puts a blinking bright reverse-image marker on the CRT at the current location and is sensed by MARKER on the Trigger menus.	Invalid

Key	Program Mode	Monitor (Real-time)	Monitor (Freeze)
	From bit mask entry field, returns cursor to next character in string or in "1 OF" list or in ENHANCE or SUPPRESS list.	If, on Parameters 2 menu, REV IMAGE: INTERFACE = ON, MKER is selected, all data received while ENTER is held down will be displayed in reverse image. If the Interface leads are recorded on tape, then the marker (i.e., ENTER key status) is also recorded.	
DON'T CARE	Enters Don't Care character in a string.	Invalid	Invalid
HEX	Latches next two alphanumeric keys (blue keys) to enter one hexadecimal character.	Successive operation places the CRT alternately in and out of hexadecimal display mode. To display only control characters in hexadecimal, operate CONTROL plus HEX.	
NOT EQUAL	In a data entry field, NOT EQUAL followed by a character or BIT MASK selects all characters not equal to the character. Applicable to SUPPRESS and ENHANCE (Parameters 2 menu) and STRG and "1 OF" (Trigger menus).	Invalid	Invalid
BIT MASK	Used to select all characters having same bit(s) at selected bit position(s). Applicable to SUPPRESS and ENHANCE (Parameters 2 menu) and STRG and "1 OF" (Trigger menus). *Note:* ENTER must be used to return from Bit Mask expansion to the next character in the string or list.	Invalid	Invalid
SAVE PROG	Moves tape to program storage area and stores the current program on tape. An error message is displayed if no tape is inserted or if the RECORD tab is in the "protect" position.	Invalid	Invalid
LOAD PROG	Moves tape to program storage area and loads program from tape. CHECKSUM ERROR is displayed if block cannot be loaded error-free into the 3500.	Invalid	Invalid

Key	Program Mode	Monitor (Real-time)	Monitor (Freeze)

5.3 GREEN KEYS: MONITOR ZONE (See also Table 8-1.)

MONITOR	Sets the unit in Monitor Mode from any Program Mode display and starts test. Enables all green keys.	Except after the HALT key has been operated, MONITOR resets all counters and timers, forces the receivers out of synchronization, and restarts the test, but does not move tape to the initial block number. After HALT, the MONITOR key continues the test without resetting measurements or tape.
DATA	Invalid	Displays real-time data from the selected source. Restores data display after Program Summary or Results.
PROGRAM SUMMARY	Invalid	Displays trigger summary. Unit remains in Monitor Mode. Program, counters, and timers continue.
RESULTS	Invalid	Displays real-time counters and timers.
HALT	Invalid	Suspends all Monitor operation, including counters and timers. Stops tape. Does not fill in the two blank lines in display where the new data has been overwriting the old. To resume monitoring operation without resetting, press MONITOR once.

5.4 GREEN KEYS: CRT CONTROL ZONE (See also Table 8-1.)

MANUAL UNFREEZE	Invalid	Starts real-time data display; overrides trigger control of CRT freeze. Turns off the FREEZE status LED; turns on MANUAL LED.
MANUAL FREEZE	Invalid	Stops real-time data display; overrides trigger control of display. Displays binary pattern of the character (or characters, in dual-line display) at the cursor position in upper right section of CRT. Fills in the two blank lines in the running display where the new data was overwriting the old. Turns on the FREEZE and MANUAL status LEDs. Turns off the TRIGGER status LED. In tape playback mode, stops tape playback.
RESUME TRIGGER	Invalid	Returns the display to trigger control after MANUAL FREEZE or MANUAL UNFREEZE. Turns off MANUAL status LED; turns on TRIGGER status LED. If FREEZE LED comes on, trigger has frozen display.
CLEAR CRT	Invalid	Clears the CRT screen (and entire 1920-character buffer) of old data momentarily.
SELF TEST	Invalid	Displays all fonts in code selected on Parameters 1 menu. Operate SELF TEST again to restore previous display mode. Does not affect program operation.

Key	Program Mode	Monitor (Real-time)	Monitor (Freeze)

5.5 GREEN KEYS: CAPTURE MEMORY ZONE

MANUAL START	Invalid	Causes the tape to start recording (or playback); overrides trigger control. Turns on RECORD status LED and MANUAL status LED.	
MANUAL STOP	Invalid	Causes the tape to stop recording (or playback); overrides trigger control. Turns off RECORD status LED; turns on MANUAL status LED.	
RESUME TRIGGER	Invalid	Returns tape to trigger control after MANUAL START or MANUAL STOP. Turns off MANUAL status LED. If RECORD LED comes ON, a trigger has turned on the tape.	

5.6 BLUE AND GRAY KEYS: TYPEWRITER AREA

Square Gray and Blue keys	Alphanumeric characters, control characters, special symbols. Keys that also are used for hexadecimal entry in conjunction with red HEX key) are blue.	When Results are displayed, C followed by 1, 2, 3, or 4 resets the corresponding counter. When Results are displayed, T followed by 1 or 2 resets the corresponding timer. When Results are displayed, R resets all counters and timers.	When data is displayed, B moves the CRT window to the Beginning of the buffer; E moves the CRT window to the End of the buffer. F automatically tabs the cursor to the next Frame-control byte and displays the mnemonic expansion (INFO, RNR, NR, etc.) on line 2. P automatically tabs the cursor to the next Packet-type byte and displays the mnemonic expansion (LCN, INFO, RNR, PR, Q, D, M, etc.) on line 2. CONTROL plus F or CONTROL plus P displays the mnemonic expansion for the character at the current cursor position. *Note: In this case the logic cannot identify invalid actions.*

Key	Program Mode	Monitor (Real-time)	Monitor (Freeze)
			On dual-line display, T selects TD, and R selects RD, for all following uses of CONTROL plus F or CONTROL plus P. R cancels preceding T and vice versa.
SHIFT (and LOCK)	Hold SHIFT down (or LOCK it down) while accompanying key, or keys, is operated to give upper-case or special character. SHIFT releases LOCK.	Invalid	Invalid
	SHIFT plus CLEAR FIELD clears current data field from cursor to end of field.		
CONTROL	Must be held down while accompanying key is operated.	Invalid	Invalid
	Used with an alphanumeric key, gives control character.		
	With red CLEAR FIELD key clears the entire displayed menu to default selections.		
	With CURSOR, moves cursor directly to last position in direction of arrow.	CONTROL plus HEX alternately displays control characters in hexadecimal.	
FLAG (BOP Format)	CONTROL plus FLAG enters *Flag* byte for HDLC framing (zero stuffing).	Invalid	Invalid
	(Note: The key sequence HEX, 7, E will not be read as a *Flag*.)		

6 Power-Up

Before you power up the INTERVIEW 3500 be sure to read Section 3 of this Manual.

CAUTION: Whenever you power up the instrument, be sure that the ventilator fan at the rear is running.

6.1 POWER-UP WITHOUT TAPE (3500 or 3000).

6.1.1 Operate the red POWER switch on the front panel. The CRT will show the power-up display of Figure 6-1.

In the case of the INTERVIEW 3000 the TAPE line will be absent.

6.1.2 The red POWER key is an alternate-action key: simply press it a second time to power down the INTERVIEW.

6.2 POWER-UP WITH PROGRAM TAPE INSERTED

6.2.1 Check that the RECORD tab on the tape cartridge is not in the record position (the tab should be toward the center of the cartridge).

Insert the tape with the drive wheel to the rear and the transparent window on top. Push it gently in until you feel it lock.

6.2.2 Operate the red power switch. The tape is automatically searched for a program in its protected location after the internal self tests are complete. The program is automatically loaded and a power-up menu with the TEST ID displayed, as shown in Figure 6-2.

If no program is found on the tape, NO PROGRAM FOUND will appear on the TAPE line.

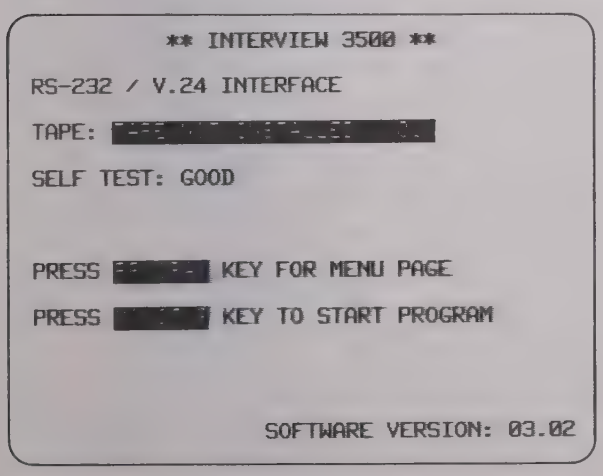

Figure 6-1

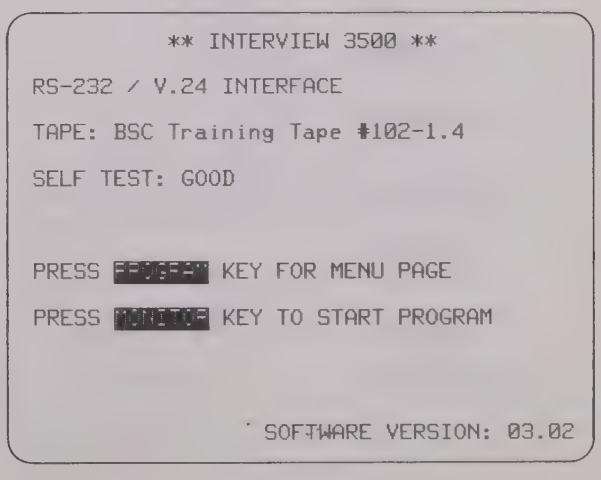
** INTERVIEW 3500 **
RS-232 / V.24 INTERFACE
TAPE: BSC Training Tape #102-1.4
SELF TEST: GOOD
PRESS PROGRAM KEY FOR MENU PAGE
PRESS MONITOR KEY TO START PROGRAM
SOFTWARE VERSION: 03.02

Figure 6-2

6.3 THE POWER-UP MENU

6.3.1 If an error is found during the power-up interactive diagnostics among the internal microprocessors, a code indicative of the defective subassembly will be displayed after SELF TEST. Refer to Section 16.4 for a list of error codes.

6.3.2 As Figures 6-1 and 6-2 show, the operator must choose between two keys at this point: PROGRAM and MONITOR. Any other key will cause a KEY ERROR response on line 2 of the display and an audible signal. KEY ERROR clears after 3 seconds or when a correct key is operated.

6.4 TAPE INSERTED AFTER POWER-UP

6.4.1 With no tape installed, operate the red power switch. The power-up display (Figure 6-1) will indicate TAPE NOT INSTALLED.

6.4.2 Insert the tape as in Section 6.2.1. At this point, you could enter a program in the unit as explained in Section 10 (or use the default program if it is appropriate (see Section 7) and then press MONITOR to monitor the data on the tape.

CAUTION: Do not power down the unit while it is in Monitor Mode. Press PROGRAM to stop tape motion first.

If you wish to load a program stored on the tape, see Section 6.4.3.

6.4.3 Operate the PROGRAM key. This places the INTERVIEW in the program mode and displays a Program Selections menu (Figure 6-3) which includes, PRESS LOAD PROG TO READ PRGM FROM TAPE.

```
** PROGRAM SELECTIONS **

PRESS PARAMETERS THEN 1
      TO DISPLAY THE BASIC MONITOR MENU

PRESS PARAMETERS THEN 2
      TO DISPLAY THE CRT & TAPE MENU

PRESS TRIGGER THEN TRIGGER NUMBER 1-8
      TO DISPLAY THE TRIGGER MENU

PRESS STATISTICS
      TO DISPLAY THE COUNTER/TIMER MENU

PRESS LOAD PROG TO READ PRGM FROM TAPE

PRESS SAVE PROG TO STORE PRGM ON TAPE
```

Figure 6-3
Program Selections Menu

Press LOAD PROGram to the right of the CAPTURE MEMORY zone. The microprocessor that controls the tape will automatically reposition the tape to the program area and read the program. A Basic Monitor menu displaying the title of the taped program will appear (Figure 6-4).

```
** PROGRAM MODE -- BASIC MONITOR **

TEST ID: ESC Training Tape #102-1.3
SOURCE : LINE TAPE DATA TAPE DATA
         START: BLOCK 000  CONTINUE
MONITOR: DATA  DTE  DCE
CODE   : EBCDIC  ASCII  EBCD  XS-3
         IPARS  REV EBCD  BAUDOT HEX

FORMAT : BISYNC  BOP BOP/NRZI ASYNC
         SYNC CHARS: 16
         OUT SYNC  : OFF ON  CHAR:16 #:1
         AUTOSYNC  : OFF ON

         SPEED: 9600
```

Figure 6-4

6.5 MONITORING DATA

6.5.1 If the taped program loaded into the 3500 (as in Section 6.2 or 6.4) selects TAPE as data source, and the tape does contain recorded data, then the taped data will automatically be monitored when the MONITOR key is pressed. Simply press the green rectangular MONITOR key and view the data on the screen.

CAUTION: Always press PROGRAM to stop the tape before you power down the unit.

For a description of the data highlights and what you can do from the keyboard in Monitor Mode, see Sections 8 and 9.

See Section 16.2 for volume and brightness adjustment.

To learn how to read or edit a program that has been loaded, see Sections 10 and 11.

6.5.2 If you have no taped programs, but have a BISYNC data source (tape or line) available, you should read Section 7 next.

6.5.3 If you have neither a tape nor a BISYNC source, you should read Section 10, at least through 10.2, before you look at the Monitor Mode sections (Sections 8 and 9).

7 BISYNC Default Program

If you have *BISYNC data* available, on either a line or tape, this section enables you to use the 3500's BISYNC default program to monitor data; and accustoms you to going between the Program and Monitor Modes.

7.1 PROGRAM MENU

After power-up without a tape, press the rectangular PROGRAM key. If you select in succession each of the first four items on the menu that is then displayed, you will have viewed all the parameters of the BISYNC default program. Return to PARAMETERS 1 and notice, as in Figure 7-1, that there is no Test ID, indicating that this is the default program.

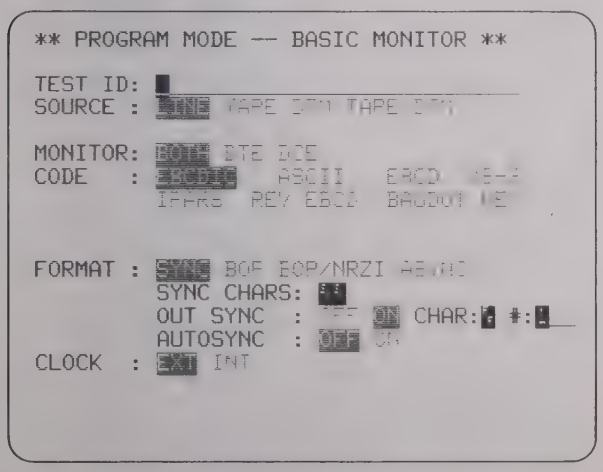
** PROGRAM MODE -- BASIC MONITOR **
TEST ID:
SOURCE : LINE
MONITOR: BOTH DTE DCE
CODE : EBCDIC ASCII EBCD
FORMS REV EBCD BAUDOT
FORMAT : SYNC BOP EOP/NRZI
SYNC CHARS:
OUT SYNC : OFF ON CHAR:
AUTOSYNC : OFF ON
CLOCK : EXT INT

Figure 7-1

7.2 LINE DATA SOURCE

The default program selects LINE for the data SOURCE (Figure 7-1). If you want to monitor BISYNC LINE data, skip Section 7.3.

7.3 BISYNC TAPE AS DATA SOURCE

To select TAPE instead of line as a data source, press ENTER. The blinking cursor moves down to LINE. Press the right CURSOR arrow once and you will have selected TAPE as data source.

Insert the data tape after power-up but before you press the MONITOR key.

7.4 MONITOR MODE

Once the appropriate data source has been selected, you may press the rectangular MONITOR key to enter Monitor Mode and observe the data stream on the CRT.

CAUTION: Operate the PROGRAM key to stop the tape before you power down the INTERVIEW.

7.5 DUAL-LINE OPERATION

To observe data from a full-duplex circuit in time-correlated dual-line display, press PROGRAM, PARAMETERS, and 2. This will give the display of Figure 7-2. The blinking cursor will be on SINGLE LINE.

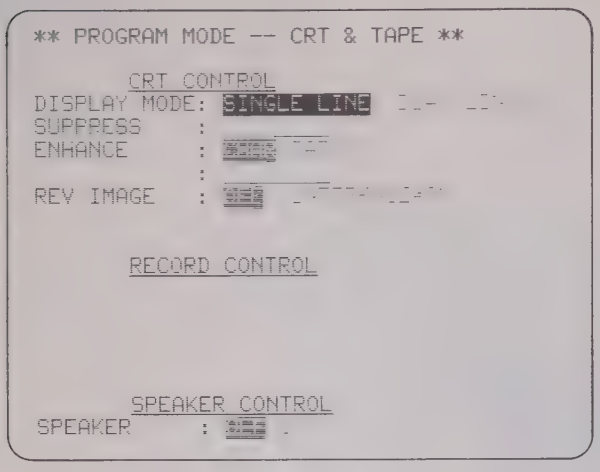

Figure 7-2

Press the right CURSOR arrow once to select DUAL LINE. Then press MONITOR to view data in dual-line display.

7.6 PROGRAM EDITING

To make other changes in the default program, see Section 10.

8 Monitor Mode: Real-Time

Sections 8 and 9 comprise an overview of the INTERVIEW's Monitor Mode, and explain the use of the instrument's various Monitor Mode capabilities. If you do not have a training tape with a stored program and data, and cannot use the unit's BISYNC default program for your data, you should read Section 10 before these sections.

8.1 INTRODUCTION

The INTERVIEW CRT can display 640 characters (16 lines of 40 characters each) from a 1920-character buffer. It can display only transmitted or received data or both, in either single-line or dual-line format.

Many aids to data analysis can be selected directly in Monitor Mode, including hexadecimal display, data freeze, display of the rest of the buffer content (1280 more characters), and the actions of the various green Monitor Mode Keys. Selected character bit patterns may be displayed, and, for bit-oriented protocols, mnemonic expansions of frame-control or packet-type bytes are available.

Many more highlights can be selected in Program Mode, including data freeze, hexadecimal display, reverse image, low intensity, blink, alarm, and suppression of selected characters (see Sections 10 and 11).

8.2 PROGRAM SELECTION

You may use the instrument's default BISYNC program if it is suitable for your data (see Section 7), or insert a taped program (3500 only; see Section 6), or select the appropriate parameters from the Program Mode menus (see Section 10).

8.3 DATA SOURCE

Connect the INTERVIEW to the appropriate data source (see Section 3.4).

8.4 DATA DISPLAY

Once the appropriate program has been loaded and the data source connected, press the green rectangular MONITOR key, *once*.

Line 1 of the screen (Figure 8-1) will display the mode, MONITOR, and the data SOURCE. On the second line will appear basic monitor parameters from the Parameters 1 menu of the program.

8.4.1 Single- or Dual-Line Display. Single- or dual-line display is selected in Program Mode on the Parameters 2 menu. (See Section 10.4.1.)

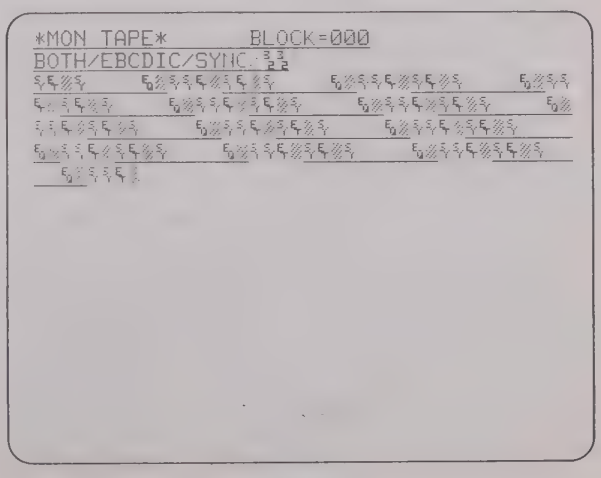

Figure 8-1

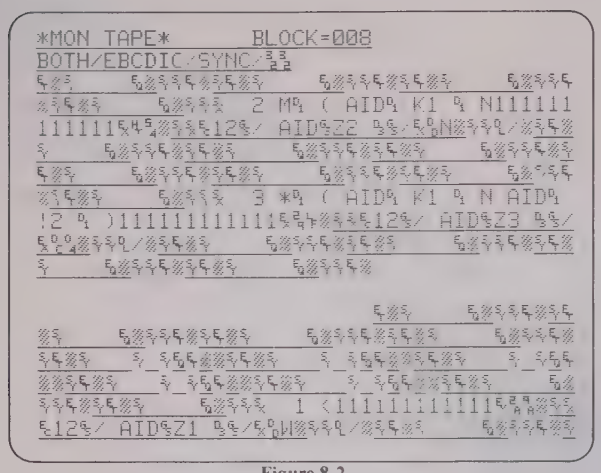

Figure 8-2

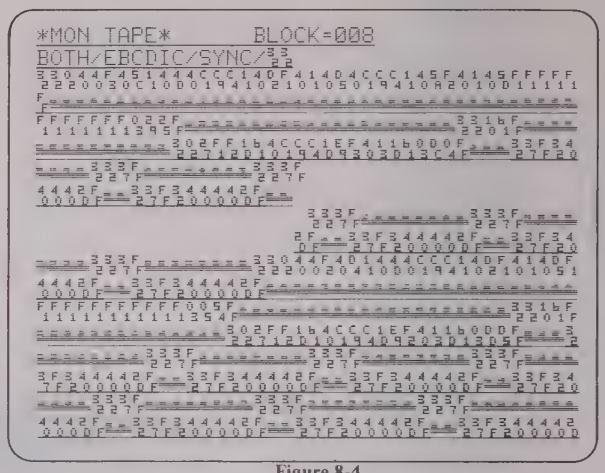

Figure 8-4

In single-line display (Figure 8-2), DCE and DTE data are displayed alternately on the same line. They are easily distinguished because *DCE* data is always underlined (to identify it as originating from the communication *line*).

In dual-line display (Figure 8-3), DTE data begins on the first data line. DCE data (always underlined) is shown on alternating lines beginning with the second data line. Time correlation is maintained by the fill symbol, which is a low-intensity block **L**.

8.4.2 Highlights. To display all data in hexadecimal, press the red HEX key once (see Figure 8-4); to return to the original text display, press HEX again.

To display only control characters in hexadecimal (see Figure 8-5), hold the CONTROL key down while operating HEX. To restore the original text, press CONTROL plus HEX again.

Other data highlights, illustrated in Figure 8-6, include reverse, low-intensity, and blink. They are chosen in Program Mode (see Sections 10.4 and 11).

8.4.3 Tape as Data Source. When the data source is the 3500's tape, the tape block number is displayed on the first line and can be seen to increment.

The data display may be speeded up or slowed. Each operation of the UP cursor arrow doubles the playback to a maximum of 9.6 kbps. Each operation of the DOWN cursor arrow halves the playback speed to a minimum of about 14 bps.

8.5 MONITOR MODE KEYS

Monitoring activity during each of the various displays obtained with the green Monitor Mode keys is summarized in Table 8-1.

8.5.1 To review the program Trigger Summary (explained in Section 11) without leaving Monitor mode,

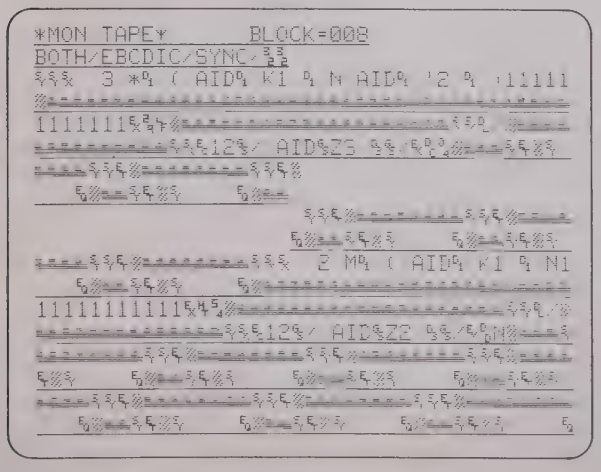

Figure 8-3

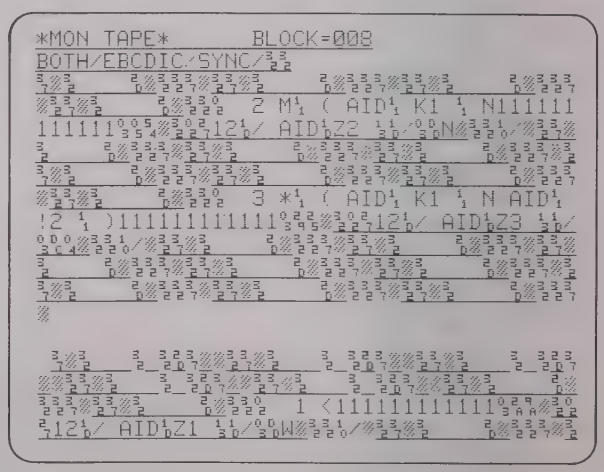

Figure 8-5

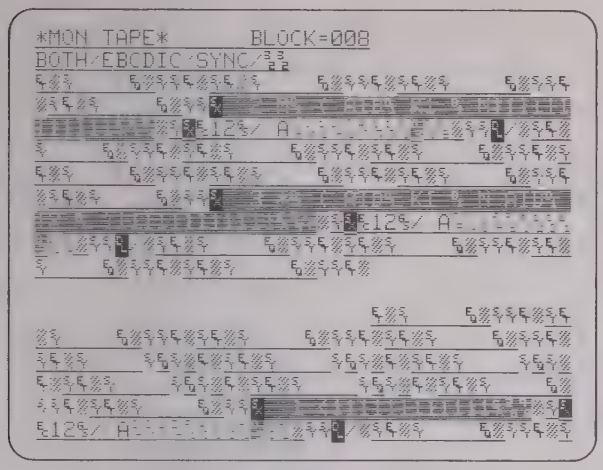

Figure 8-6

press PROGRAM SUMMARY (see Figure 8-7). Operate DATA to resume the real-time data display. While the Program Summary is displayed, no data is received by the CRT buffer, but the counters and timers receive data and the test continues to run.

8.5.2 To view the real-time counter and timer accumulation, operate RESULTS (see Figure 8-8).

The maximum for either counts or time is 65,535. OVFLOW is displayed to the right of any counter or timer that has overflowed.

While Results are displayed, C followed by 1, 2, 3, or 4 resets the corresponding counter; T followed by 1 or 2 resets the corresponding timer; and R resets all counters and timers.

No data is received by the CRT buffer while Results are displayed.

The DATA key returns real-time data to the screen.

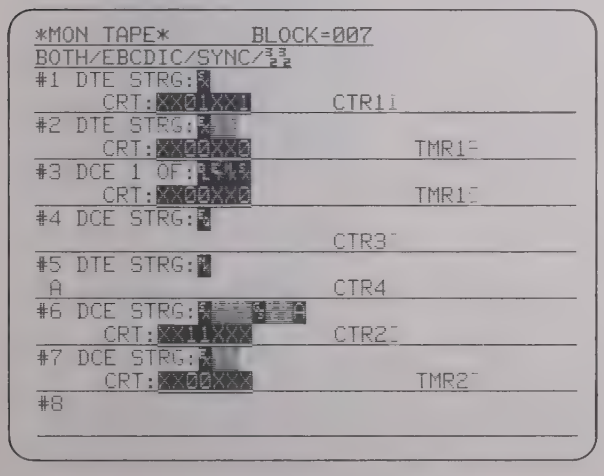

Figure 8-7

8.5.3 To restart the test at any time, press Monitor. This forces the receivers out of synchronization, resets all counters and timers, and restarts the triggers. It does not cause the tape to rewind.

8.5.4 HALT suspends all monitor activity and freezes the current data on the screen. Counters and timers stop, but do not reset. In the 3500, tape playback or recording stops but the tape does not rewind.

To resume monitoring after HALT, press MONITOR *once*. All monitor activities will simply resume from the point at which they stopped: counters and timers will not reset in this case. If the data source is the 3500 TAPE, no data will have been lost since the tape stops; if the source is LINE, all input signals during the time the INTERVIEW was in the Halt Mode will have been ignored.

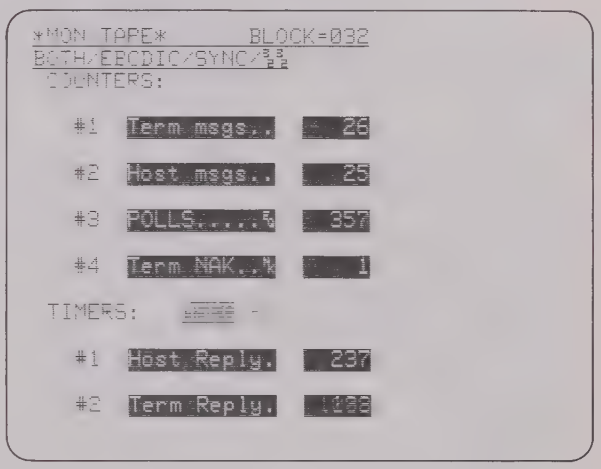

Figure 8-8

8.5.5 Pressing CLEAR CRT clears the screen of data. If real-time data flow is being displayed, the screen is clear only momentarily; if the display is frozen, the screen remains clear until the real-time data flow is resumed.

8.5.6 SELF-TEST is an alternate-action key which displays the full character font for the code selected on the Parameters 1 menu. The HEX key and CONTROL plus HEX are effective on this display. This display is also useful for CRT brightness adjustment (see Section 16.4.2). *Note:* The SELF-TEST key is not related to the internal self tests conducted automatically at power-up (discussed in Section 16.5).

8.5.7 ENTER. In Monitor Mode, when the data source is not tape, the ENTER key can be used to mark incoming data when it first appears on the screen: The

last character received before ENTER is depressed will appear in blinking bright reverse image, just like a cursor. If the display is frozen (MANUAL FREEZE key) while the marked characters are still on the screen, the markers will remain and you will then be able to study the data of interest. The marker may be reverse-imaged (see also Section 10.4.4), recorded (see Section 10.5.4), or sensed by triggers (Section 11.1.2).

8.6 CAPTURE MEMORY

The three Capture Memory keys control tape motion, whether the tape is recording or playing data back.

Just as in the case of the CRT Control keys, MANUAL STOP and MANUAL START override program control of the tape. Only RESUME TRIGGER will return the tape to program control.

Table 8-1
Counter, Timer, and Tape Operation in Monitor Mode

Keys	Counter	Timers	Tape (3500 only)	
			Data Playback	Recording
DATA	As commanded	As commanded	Continues	As commanded
PROGRAM SUMMARY	As commanded	As commanded	Continues	As commanded
RESULTS	As commanded	As commanded	Continues	As commanded
HALT	Stop; do not reset	Stop; do not reset	Stops; does not rewind	Stops; does not rewind
MONITOR	Reset (except after HALT)	Reset (except after HALT)	Continues	Continues
FREEZE (Manual or Trigger)				
Line data	As commanded	As commanded	—	As commanded
Taped data (3500 only)	Stop; do not reset	Stop; do not reset	Stops; does not rewind	—
CLEAR CRT	As commanded	As commanded	Continues	As commanded
SELF TEST	As commanded	As commended	Continues	As commanded

9 Monitor Mode: Manual Freeze

FREEZE, whether manual or under programmed trigger control, means that no new data is being added to the CRT screen or buffer. Data already received is "frozen" on the screen and in the buffer. The CRT Freeze indicator on the status panel is ON.

In MANUAL FREEZE, the two blank lines on the screen where the new data was overwriting the old are filled in and a character bit pattern is displayed at the upper right. Notice the difference between the Manual Freeze display (Figure 9-1) and that seen in Trigger Freeze or Halt Mode (Figure 9-2).

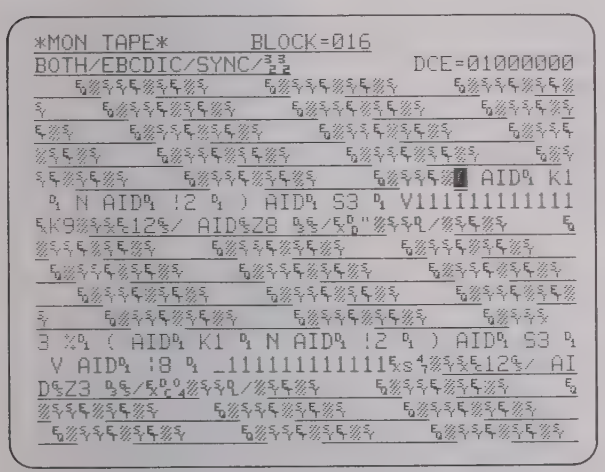

Figure 9-1

9.1 CONTROL of FREEZE

Trigger control of CRT Freeze is the default condition. The MANUAL FREEZE and MANUAL UNFREEZE keys both override Trigger control of the CRT. You may manually freeze and unfreeze the display as often as you wish, but trigger control can be restored only by pressing RESUME TRIGGER.

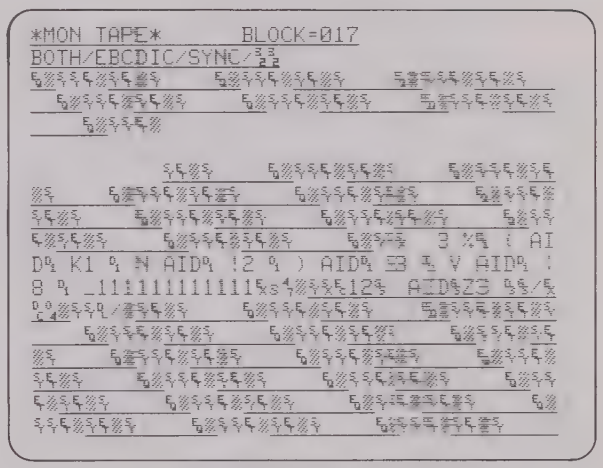

Figure 9-2

When the CRT is frozen under trigger control, the display is no different than in Halt Mode.

The CRT status LEDs always indicate whether the display is frozen and whether it is under manual or program (trigger) control (see Section 4.2.2).

9.2 MONITOR ACTIVITY

When the display is frozen, whether manually or under trigger control, data reception, counting, and timing continue as programmed or manually commanded, and real-time Results can be viewed just as during real-time Data display.

9.3 TAPE

Notice that if the data source is TAPE, the tape block number is displayed at the top of the screen but does not increment, indicating that tape motion has stopped.

If the data source is LINE, and the tape is recording line data, it continues as commanded by the program or as manually instructed.

9.4 CURSOR

The two blank lines where the new data was overwriting the old when the display was running real time fill in when the display is manually frozen (see Figure 9-1; compare with Figure 9-2). However, the cursor is at the latest character of the new data, so it is easy to tell where the new data begins.

To display the beginning of the buffer, operate the B key. The E key will display the end of the buffer. Intermediate positioning of the CRT window can be accomplished with the up or down cursor arrow. When the cursor reaches the top or bottom of the window, it pulls the next line of data onto the screen.

The right (or left) cursor arrow moves the cursor right (or left) until it "wraps around" to the beginning (or end) of the next (or preceding) line.

Notice that the cursor will not move into the oldest data. The cursor forms a boundary between the oldest and the most recent data: when it is moved to the left or up the oldest data is transferred to the CRT buffer. The old data can be viewed by scrolling back through the buffer with the cursor or the B key.

Note: In some units, manual positioning of the cursor on a data display may randomly cause a character at the cursor location to change from hexadecimal to text or vice versa. The character will revert to its original display form when the cursor is moved away.

9.5 CHARACTER BIT BREAKDOWN

At the right end of the top line (or top two lines in the case of dual-line display), the character (or characters) at the cursor location is broken down into its binary pattern and its source identified as DCE or DTE (Figure 9-3). You can obtain this binary breakdown of any character on the screen simply by operating the cursor keys.

NOTE: The rightmost bit is the first serial bit.

9.6 OTHER MONITOR KEYS

HEX or CONTROL plus HEX can be used just as in real-time monitoring.

CLEAR CRT, SELF TEST, PROGRAM SUMMARY, DATA, HALT, and the CAPTURE MEMORY keys also work in Freeze.

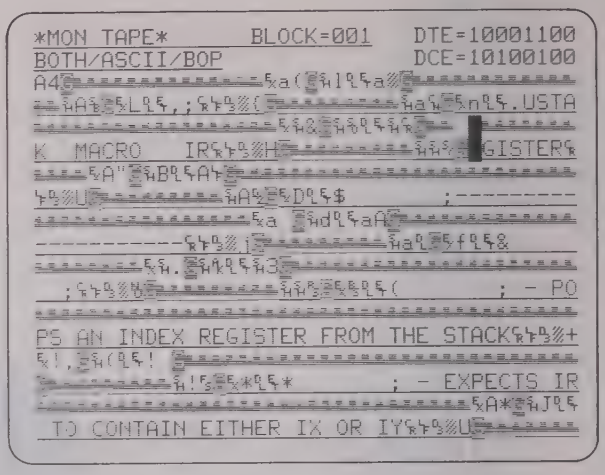
MON TAPE BLOCK=001 DTE=10001100
BOTH/ASCII/BOP DCE=10100100
; - PO
PS AN INDEX REGISTER FROM THE STACK
; - EXPECTS IR
TO CONTAIN EITHER IX OR IY

Figure 9-3

9.7 BIT-ORIENTED PROTOCOLS; BISYNC-FRAMED X.25

When BOP has been selected on the Basic Monitor menu (Section 10.2.8), several special features become available in the Monitor Mode. At the frame level, these are valid for most bit-oriented protocols—HDLC, SDLC, X.25, X.75; at packet level, they apply to X.25 and X.75 only. Both the frame- and packet-level mnemonic expansions are also valid for BISYNC-framed X.25 (ASCII or EBCDIC).

HDLC *Flags* ($7E_{16}$) are always displayed in low-intensity reverse image to distinguish them from data $7E_{16}$ (see Figure 9-4).

Each frame check sequence (FCS) is automatically verified and the *second* FCS character is replaced by either a low-intensity reverse-image G for a Good FCS, or a bright reverse-image B for a Bad FCS (Figure 9-5). An

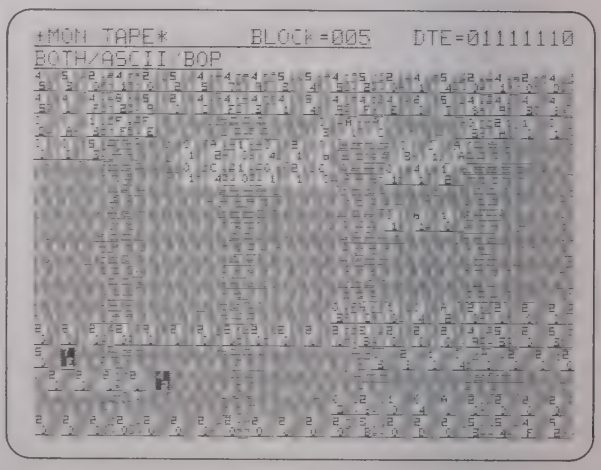

Figure 9-4

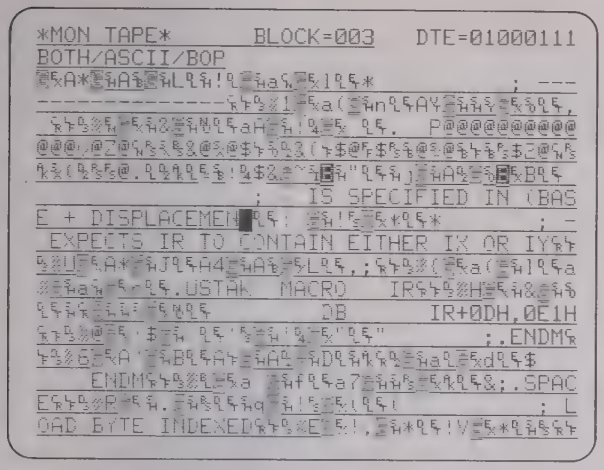

Figure 9-5

Aborted frame is identified by a bright reverse-image A.

Suggestion: Before trying the mnemonic control byte expansions described in the following paragraphs, position the cursor near the beginning of the display buffer.

When the F key is pressed, the cursor tabs to the next Frame-control byte. The mnemonics for the control frame type, the sequence number (or numbers), and the P/F bit value are displayed on the second line. The binary breakdown of the character at the cursor location is displayed at the upper right as usual. (See Figure 9-6.)

Notice that the binary expansion is given with the first bit sent (low-order bit) at the far right and the highest-order bit to the left. In dealing with bit-oriented protocols it is important to remember that there are considerable discrepancies in the literature regarding the order in which the bits are presented on paper, as well as how they are numbered.

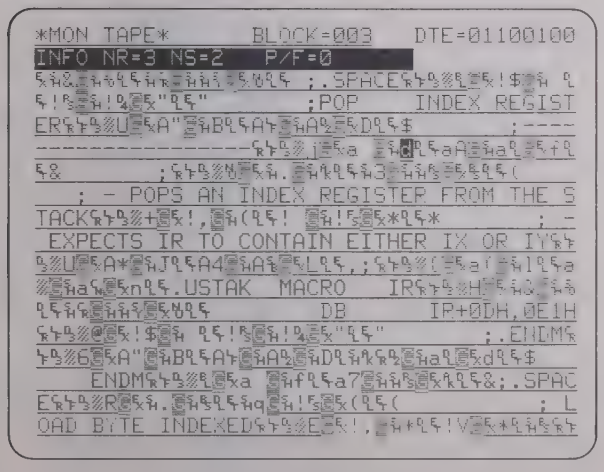

Figure 9-6

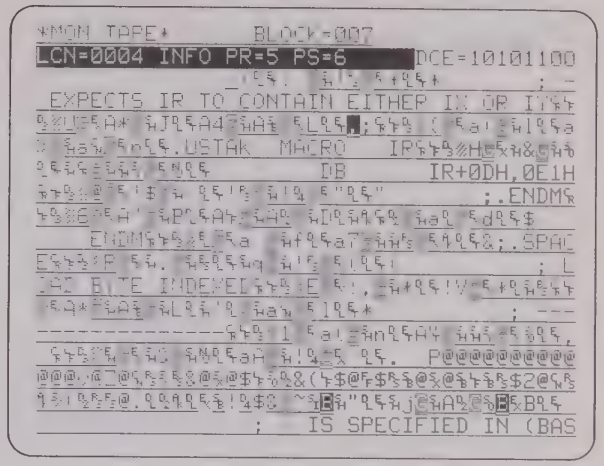

Figure 9-7

To find the next Packet-type octet (Octet 3),

Octet 1		Octet 2			Octet 3			
1 1	0 1	XXXX	X X X X X X X X		X X X	X	X X X	0
Q D	Mod 8	12-Bit Logical Channel (LCN)			P(R)	M	P(S)	

press the P key. The cursor will tab to the byte. On the second line the 3500 will display the logical channel number and the sequence count modulus. For modulo 8, the packet sequence numbers, P(S) and P(R), will be given, and if the Q, D, or M bit is 1, the letter symbol will be displayed. For modulo 128, the analysis stops with display of MOD 128. Examples are given in Figures 9-7 and 9-8.

Within an information frame, alternate use of F and P will move the cursor between the frame-control byte and packet-type octet of that frame until one of the two keys is operated twice.

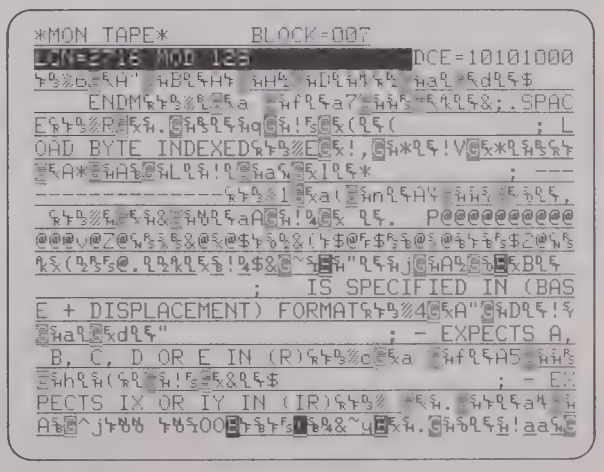

Figure 9-8

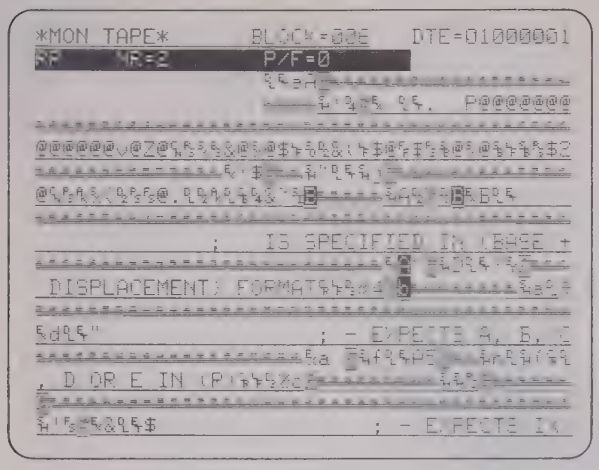

Figure 9-9

NOTE: If triggers have been programmed to freeze and unfreeze data, use of F and P may not produce correct information in the mnemonic expansion line. Leading bytes (Address, Control, Octets 1-3) must be in the display buffer for complete expansion.

You may obtain a mnemonic expansion for any character on the screen by positioning the cursor at the desired byte and pressing CONTROL plus F or CONTROL plus P. Thus you may move the cursor *back* to the control byte in which you are interested and press CONTROL plus F. *Remember, though, that in this case the logic cannot distinguish between a genuine frame-control byte or packet-type octet and the numerous invalid possibilities.*

In dual-line display, of course, the control-byte or packet-type octet expansion will only apply to one of the two cursor characters, but this is easily identified because the single binary breakdown byte at the upper right of the display will be identified as DTE or DCE. (See Figure 9-9.)

In dual line format, you may also select the lead to which you wish CONTROL plus F or P to apply. Pressing T before CONTROL plus F or P selects TD; R selects RD. Either lead selection remains in effect until you cancel it by selecting the other lead. PROGRAM cancels both T and R.

Table 9-1 lists the frame-control byte mnemonic expansions available in the 3500 display. Packet-level expansions are given in Table 9-2.

Table 9-1
X.25/X.75/SDLC Frame Control Byte Expansion

Bit Pattern 8 7 6 5 4 3 2 1	Display*	
N(R) P N(S) 0	INFO	NR = X NS = X P/F = X
N(R) P/F 0 0 0 1	RR	NR = X P/F = X
N(R) P/F 0 1 0 1	RNR	NR = X P/F = X
N(R) P/F 1 0 0 1	REJ	NR = X P/F = X
N(R) P/F 1 1 0 1	SREJ†	P/F = X
0 0 0 P/F 0 0 1 1	NSI†	P/F = X
0 0 0 P/F 0 1 1 1	SIM†/ROI†	P/F = X
0 0 0 F 1 1 1 1	SARM/DM/ROL†	P/F = X
0 0 1 P/F 0 0 1 1	NSP†	P/F = X
0 0 1 P 1 1 1 1	SABM	P/F = X
0 1 0 P 0 0 1 1	DISC†/RQD	P/F = X
0 1 0 P/F 0 1 1 1	RGA†	P/F = X
0 1 1 F 0 0 1 1	UA/NSA†	P/F = X
1 0 0 F 0 1 1 1	FRMR/CMDR†	P/F = X
1 0 0 P 0 0 1 1	SNRM†	P/F = X
1 0 1 P/F 1 1 1 1	XID†	P/F = X
1 1 0 P/F 0 1 1 1	CFGR†	P/F = X
1 1 1 P/F 0 0 1 1	LINKTEST†	P/F = X
1 1 1 F 1 1 1 1	BCN†	P/F = X
All other patterns	UNKNOWN	

* All acronyms for X.25 and X.75 frame and packet level as well as all SDLC frame-control byte commands are included. Where one bit pattern is used several ways all acronyms are displayed by the INTERVIEW.

† Frames used only by IBM.

Table 9-2
X.25/X.75 Packet-Type Expansion

	Octet 3 8 7 6 5 4 3 2 1	Display (XXXX = Decimal 0000-4096)
1	0 0 0 0 1 0 1 1	LCN = XXXX CALL
2	0 0 0 0 1 1 1 1	LCN = XXXX CALL ACCEPT
3	0 0 0 1 0 0 1 1	LCN = XXXX CLEAR
4	0 0 0 1 0 1 1 1	LCN = XXXX CONFIRM
5	P(R) M P(S) 0	LCN = XXXX INFO PR = X PS = X QDM
6	0 0 1 0 0 0 1 1	LCN = XXXX INTERRUPT
7	0 0 1 0 0 1 1 1	LCN = XXXX INTERRUPT CONFIRM
8	P(R) 0 0 0 0 1	LCN = XXXX RR PR = X
9	P(R) 0 0 1 0 1	LCN = XXXX RNR PR = X
10	P(R) 0 1 0 0 1	LCN = XXXX REJ PR = X
11	0 0 0 1 1 0 1 1	LCN = XXXX RESET
12	0 0 0 1 1 1 1 1	LCN = XXXX RESET CONFIRM
13	1 1 1 1 1 0 1 1	LCN = XXXX RESTART
14	1 1 1 1 1 1 1 1	LCN = XXXX RESTART CONFIRM
15	All other	UNKNOWN

10 Basic Setup: Parameters Menus

The red PROGRAM key places the INTERVIEW in Program Mode, enabling all the red program keys. In this mode, you may—

- Edit an existing program, the default program (see Section 7), or a program that has been loaded from a tape;
- Enter an entirely new program;
- Assign names to the counters and timers.

You may also save a program (discussed in Section 12) or load a saved program (see Section 6).

The two Parameters menus enable you to select the basic parameters necessary to monitor data, and to control the CRT display, data recording, and the speaker. All choices on these two menus are simple, unconditional instructions.

To set triggers to take actions when specified conditions occur, and to set counters and timers, see Section 11.

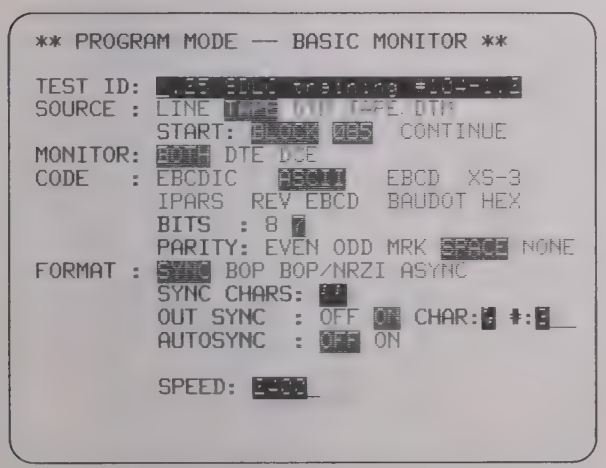
** PROGRAM MODE — BASIC MONITOR **
TEST ID:
SOURCE : LINE
START: BLOCK 000 CONTINUE
MONITOR: BOTH DTE DCE
CODE : EBCDIC ASCII EBCD XS-3
IPARS REV EBCD BAUDOT HEX
BITS : 8 7
PARITY: EVEN ODD MRK SPACE NONE
FORMAT : SYNC BOP BOP/NRZI ASYNC
SYNC CHARS:
OUT SYNC : OFF ON CHAR: #:
AUTOSYNC : OFF ON
SPEED:

Figure 10-1

10.1 ENTERING PARAMETERS

The various program menus offer two categories of programming fields (see Figure 10-1): selection fields and data entry fields. In a selection field, you are offered a choice of entries and the current selection is displayed in half-intensity reverse image. Data entry fields are displayed in bright reverse image to indicate that you may type in new entries directly from the keyboard. In Figure 10-1, for instance, the FORMAT line is a selection field, and the SYNC CHARS line is a data entry field.

Selections are made by positioning the blinking, bright, reverse-image cursor. To move the cursor from one field to the next, without changing prior selections, press the red ENTER key. The cursor will move directly to the default or prior selection in the next field or to the first position of the next data entry field. To move the cursor within a field, use the CURSOR arrows. Once you have made your selection, use ENTER to leave the field. The UP arrow will usually take you back to the preceding field if you have overshot your mark. See Section 5 for a complete description of cursor operation.

To correct a data entry, you may position the cursor on the error and *write over* it. Pressing CLEAR FIELD will clear the current *data entry* field. SHIFT plus CLEAR FIELD will clear a data entry field starting at the cursor position, and CONTROL plus CLEAR FIELD will clear an entire menu to default condition.

10.2 PARAMETERS 1: BASIC MONITOR MENU

To select all the basic parameters necessary for monitoring any variety of data, press PROGRAM to enter Program Mode; then press PARAMETERS followed by numeral 1. The display of Figure 10-2 will ap-

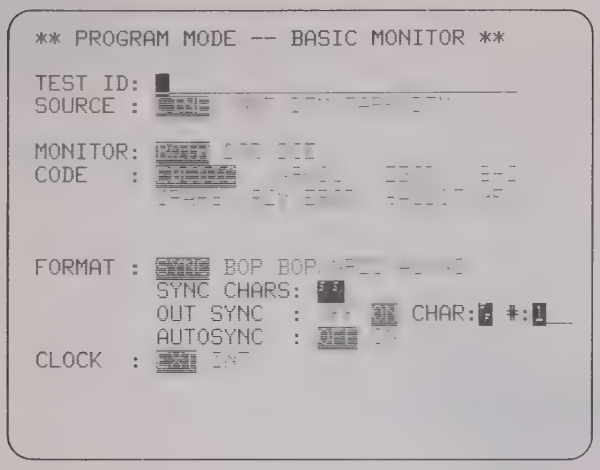

Figure 10-2

pear, but it will vary somewhat, depending on what program is already present. This is because the 3500's program menus show you only pertinent selections. As you make your selections, some new possibilities may appear while unnecessary choices will be eliminated. Thus you will neither have to make unnecessary decisions nor be allowed to neglect anything essential.

Figure 10-2 is the default program, comprising basic BISYNC parameters.

10.2.1 Line 1. The first line identifies the mode, Program, and the menu, Basic Monitor.

10.2.2 Line 2. The second line is normally blank. It is reserved for messages to the operator.

10.2.3 TEST ID (Line 3). A test identifier of up to 27 characters may be entered on this line. All alpha, numeric, and control characters are valid in this data entry field.

When a saved program has been loaded from the tape, the ID of that program appears on line 3.

If data is being recorded, it is useful to use this line to identify the system or channel, date, time, and so on, so that this information is saved on the tape along with the program and data.

10.2.4 SOURCE (Line 4). This selection field determines the source of the data to be monitored.

LINE is the default selection. When LINE is selected, the INTERVIEW will monitor data present on the communication line connected to the line interface connectors on the rear panel.

TAPE allows data that has been recorded on tape to be displayed. If the interface control leads (see Section 10.5) have been recorded, the LEDs on the front panel indicate the status of the leads at the time the data was recorded in order to give the operator the complete "picture" of the recorded data.

The next two selections, DTM and TAPE/DTM, permit the INTERVIEW to be used in conjunction with an INTERSHAKE (DTM-2). An INTERSHAKE Adapter Kit is required. See Section 13 for information on combined INTERVIEW 3500-INTERSHAKE operation.

The DTM selection allows the INTERVIEW to receive clock and CRT and Record Control signals from a DTM. Selection of TAPE/DTM permits the DTM to analyze data from the INTERVIEW 3500 tape and to control tape playback and CRT.

10.2.5 START (Line 5). This selection field only appears if the SOURCE selected is either TAPE or TAPE/DTM (see Figure 10-3). It determines at what tape block the 3500 will begin to play back data. (*Note:* Tapes should be preformatted; see Section 12 for a thorough discussion of tape operation and block numbering.)

If BLOCK 000 is selected, the tape will rewind when MONITOR is pressed and start to play from the first block recorded on the tape. This is the default selection.

The number of any other block that contains recorded data may be entered as the starting point.

CONTINUE allows playback to resume from the block that was being played before leaving the Monitor mode. For example, if during playback at Block 015 you decide to change a PARAMETER or TRIGGER selection, you may press PROGRAM, make the desired changes, and select CONTINUE. When you return to

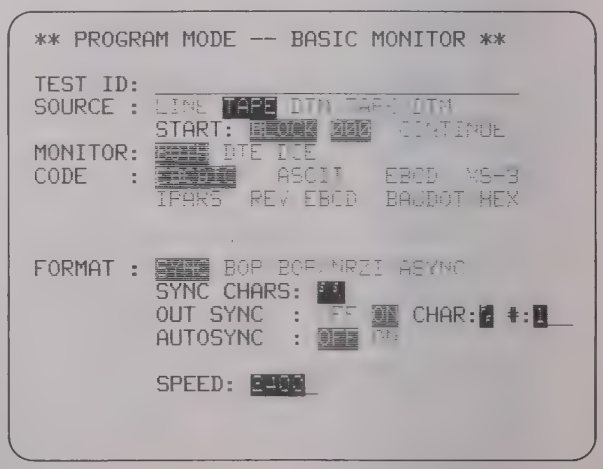

Figure 10-3

Monitor Mode, playback will automatically continue from Block 015.

10.2.6 MONITOR (Line 6). You may choose to see the data originating at the Data Terminal Equipment (DTE), the Data Communication Equipment (DCE), or BOTH. The default selection is to display BOTH.

10.2.7 CODE (Lines 7 and 8). You have a choice of seven codes or "languages." The default code is EBCDIC. In the remaining fields, you will only be shown choices allowed for your code selection. Your CODE choice also affects the default selections for some of the remaining parameters.

The HEX selection permits the 3500 to be used to monitor codes not included in the menu choices. When HEX is selected the number of bits, parity, and the SYNC characters may be operator-selected. (See Figure 10-4.) All data will be displayed in hexadecimal.

BITS (Line 9). For codes having more than one possible number of information bits, this selection field appears (Figure 10-4). For the default CODE (EBCDIC), no choice is available and this field is not visible. For ASCII, the operator is allowed to choose 8 or 7 bits. The choices allowed and the default values for each code are presented in Table 10-1.

PARITY (Line 10). For CODE selections that are used with PARITY, this selection field (Figure 10-4) allows the operator to choose parity. The parity bit is additional to the data information bits. The parity bit can be tested and parity errors can be enhanced and counted (see Sections 10.4.3 and 11.6).

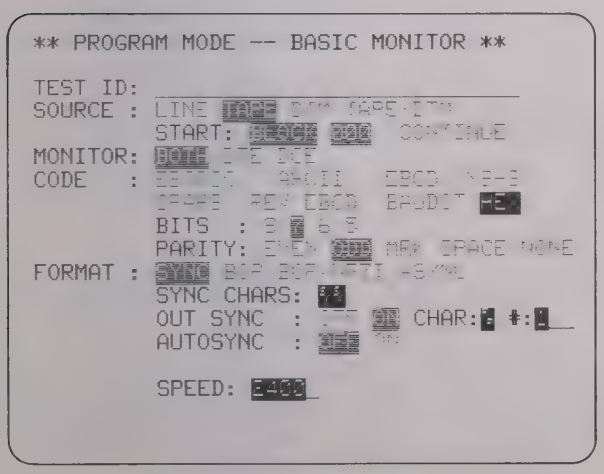

Figure 10-4

Notice that MARK or SPACE may be selected as the parity bit condition. Violations will then be considered as parity errors.

Refer to Table 10-1 for the default values for each code.

Table 10-1

	Default			Other Choices	
Code	Info. Bits	Parity	SY_1 SY_2 (hex)	Info. Bits	Parity
EBCDIC	(8)	(None)	32 32	—	———
ASCII	7	Odd	16 16*	8	———
				7	Even, Mark, Space, None
EBCD	(6)	Odd	—	—	Even, Mark, Space, None
XS-3	(6)	None	—	—	Even, Odd, Mark, Space
IPARS	(6)	(None)	3F 3E	—	———
Rev. EBCD	(6)	Odd	—	—	Even, Mark, Space, None
Baudot	(5)	(None)	—	—	———
HEX	7	Odd	16 16	—	Even, Mark, Space, None
				8	———
				6,5	Even, Mark, Space, None

* Also applies to space parity and 8-bit ASCII. For even or mark parity ASCII, SY SY defaults to $96\ 96_{16}$.

10.2.8 FORMAT (Line 11). The FORMAT selection field (Figure 10-4) allows the operator to program the INTERVIEW correctly for the protocol to be monitored. The selection made determines what choices are allowed in the following fields. To simplify programming, you are never shown an unnecessary choice that could result in an "illegal" setup or could mislead you.

The default FORMAT selection is SYNC, which requires selecting the synchronization pattern, and permits choosing OUT SYNC and AUTOSYNC.

BOP selects Bit-Oriented Protocols that use HDLC framing (that is, zero insertion), such as SDLC and X.25. In these protocols, the synchronization *Flag* pattern and the conditions for OUT SYNC are always defined, so these selection fields will not appear.

BOP/NRZI enables the INTERVIEW to decode Bit-Oriented Protocols that are being transmitted with Non-Return-to-Zero-Inverted encoding.

ASYNC, or asynchronous start-stop data, does not require any FORMAT selections other than the source of clock. With EXTernal clock, ASYNC operation is isochronous.

10.2.9 SYNC CHARS (Line 12). This data entry field determines the synchronization pattern for synchronous data formats. The synchronization characters default to SY SY. In Monitor Mode, the code chart lookup is automatically performed: the proper SY character for the code selected is displayed in hexadecimal. The code chart lookup also obeys the parity selection; for example, SY in odd-parity ASCII is 16_{16} but SY in even-party ASCII is automatically converted to 96_{16}. (See Table 10-1 for the default values of SY.)

Any other one- or two-character sequence may be entered, using alphanumeric keys, control characters, or hexadecimal. When synchronization characters are entered in hexadecimal, the selected code chart is ignored and the hexadecimal value entered is the value used.

To select a one-character synchronization pattern, position the cursor on the SYNC CHARS line, depress CLEAR FIELD, and enter only the desired character.

10.2.10 OUT SYNC (Line 13). OUT SYNC causes a receiver to go out of synchronization if it finds the entered character in the data stream. Any character may be entered in the CHAR field. The number field (#) allows you to specify how many times the character must occur consecutively (from one to 255 times) before OUT SYNC occurs. Default condition for SYNC is one FF_{16}.

In transparent text, there is the possibility that a legitimate data FF_{16} will occur. In such cases, it may be necessary to change the OUT SYNC character.

10.2.11 AUTOSYNC (Line 14). AUTOSYNC allows the INTERVIEW to recognize a synchronization pattern at any time even though the receiver logic may "think" it is already in synchronization. AUTOSYNC should only be used with a two-character synchronization pattern. When AUTOSYNC is enabled, the logic constantly tests for the two-character pattern on a bit-by-bit basis. When a match is found, it becomes the new reference point for character framing. AUTOSYNC thus eliminates the need to "bit shift" the data to find synchronization.

NOTE: The two characters usually will be displayed as "garbage" characters because the synchronization circuits maintain bit synchronization *between transmissions* rather than character synchronization. The number of bits between transmissions will not be an exact multiple of 8, and the extra bits will cause the SYNC characters to be skewed and appear as garbage characters.

AUTOSYNC is extremely useful where there is no particular end of message character (OUT SYNC), or where one block of data follows another by less than a full character interval. AUTOSYNC will detect the synchronization pattern even though it is skewed from the previous block and display the following data correctly.

NOTE: If AUTOSYNC is on, the second synchronization character may not always be displayed when the synchronization pattern is found.

10.2.12 CLOCK (Line 15). When the source of data to be monitored is LINE, this selection appears (Figure 10-2). If clock is provided on the communication interface (RS-232/V.24 pins 15 and 17), EXTernal allows the INTERVIEW to use it to clock the data receivers. The external clock must be a 1 × baud clock with the negative-going transition occurring at the middle of the data bit period.

For cases where such clock is not provided, INTernal selects the INTERVIEW's internal clock logic, which regenerates clock information from the data.

When line data is being recorded, recording will not take place if clock is not being received on both TD and RD leads. This could occur, for example, when a modem is set for NEW SYNC, which clamps the clock on one path when data is not being sent. In this case INTernal CLOCK must be selected.

10.2.13 SPEED (Line 16). This data entry field appears when (1) INTernal CLOCK has been selected or (2) TAPE has been selected as data SOURCE (Figure 10-4).

SPEED may be entered using up to five digits or four digits and a decimal point. The actual speed generated internally is determined by dividing the speed entered into 57,600. The result is rounded to the nearest integer and becomes the clock divider value. The true internal speed is equal to the clock divider value divided into 57,600.

When INTernal CLOCK has been selected on Line 15, the correct speed of the system being monitored must be entered here for clock information to be regenerated from the line data. If EXTernal clock has been selected, the SPEED selection does not appear.

When the tape is being replayed (TAPE selected as data SOURCE), the speed entered determines the speed at which the data will be played back.

10.3 PARAMETERS 2: CRT, TAPE, SPEAKER CONTROL

Press PARAMETERS, then 2, in Program Mode to display three menus: CRT CONTROL (Section 10.4), RECORD CONTROL (Section 10.5), and SPEAKER CONTROL (Section 10.6) (see Figure 10-5).

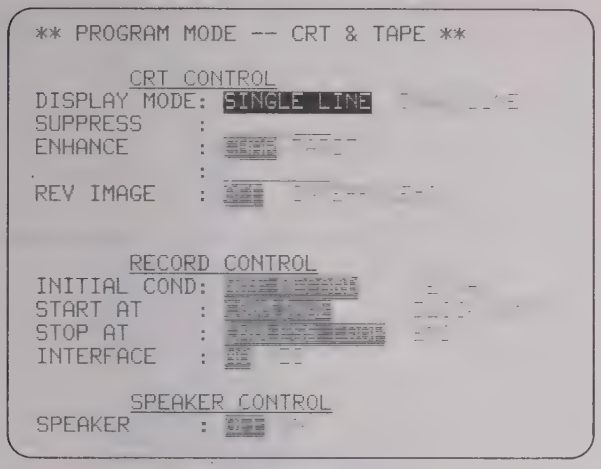

Figure 10-5

10.4 CRT CONTROL

10.4.1 DISPLAY MODE. You may select SINGLE LINE or DUAL LINE. (See Section 8.4.1.)

SINGLE LINE is the default selection. If BOTH has been selected for SOURCE on the Parameters 1 menu, DCE and DTE data will be displayed alternately on the same line.

DUAL LINE maintains time correlation between DCE and DTE data. Dual-Line display is essential for viewing simultaneous FDX data, but it should only be used when required because the single-line display uses the CRT and buffer space much more efficiently.

10.4.2 SUPPRESS. You may choose up to eight characters to be suppressed from the CRT display. They will not appear on the CRT or in the CRT buffer, which allows you to obtain a highly condensed, selective display.

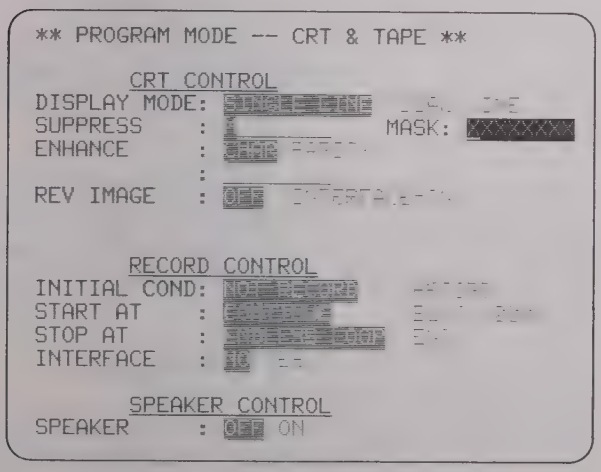

Figure 10-6

However the suppressed characters will be received, considered by the triggers, included in counting and timing where applicable, and recorded if data is being recorded.

The characters to be suppressed can be entered directly from the keyboard and may include—

- Upper- and lower-case alpha characters and numerals
- Control characters
- Hexadecimal entries
- One Bit Mask
- All characters NOT EQUAL to a given character or bit mask.

BIT MASK. With the cursor on the SUPPRESS line, press the red BIT MASK key. At the right end of the line, MASK followed by an 8-place data entry field will appear (see Figure 10-6). The cursor will be at the first place in the field. Each X in the data entry field represents one bit of an 8-bit character, with the low-

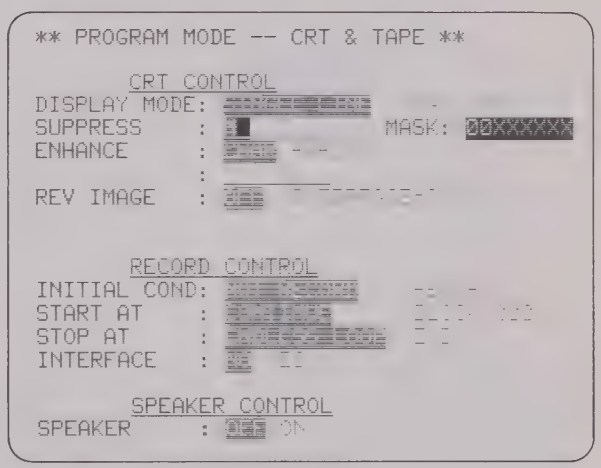

Figure 10-7

order, first serial bit on the right. X's means Don't Care. You may replace any number of the X's with ones and (or) zeros. If, for instance, you enter 00 for bits 8 and 7, the pattern will now be 00XX XXXX. All characters having 00 for bits 8 and 7 will now be suppressed, as indicated by the low-intensity M in the list of suppressed characters (Figure 10-7). In EBCDIC all control characters have zeros for bits 7 and 8, so if the code selection were EBCDIC, all control characters would now be suppressed from the display.

NOTE: A low-intensity character in a data entry field always indicates that the character represents something other than itself.

To return to the SUPPRESS list, use ENTER. To get back to the MASK field, press BIT MASK again.

Changing the code selection does not affect the number of bits displayed in the mask. If you have selected a code with less than eight information bits, say five, use the five lower-order (rightmost) bits and ignore the three excess higher-order bits. (The excess high-order bits default to 0 and cannot be changed.)

NOT EQUAL. You may suppress all characters *not equal* to any given character. To suppress all characters but NAKs for example, press NOT EQUAL, then CONTROL plus NAK. Notice that NK is now displayed in the *SUPPRESS* list with a bar through it (Figure 10-8).

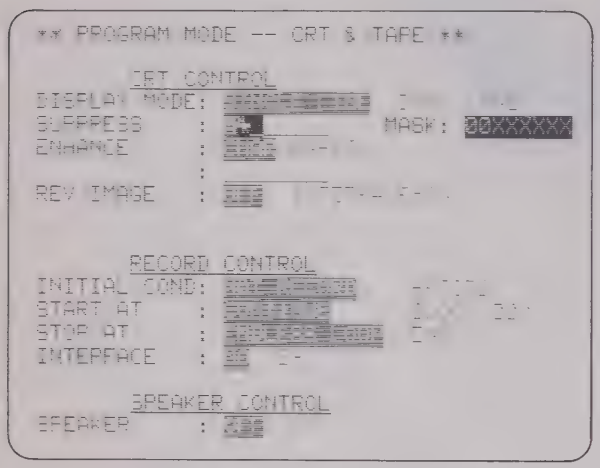

Figure 10-8

10.4.3 ENHANCE. Enhanced characters will be displayed in blinking, bright, reverse image.

If you select CHAR on the ENHANCE line, you may enter up to eight characters on the next line. Valid characters are the same as for SUPPRESS.

If you select ENHANCE PARITY, each character with a parity error will be displayed with a horizontal bar through it.

When ENHANCE PARITY is selected, Triggers 7 and 8 are automatically set to count parity errors using Counters 3 and 4 (see Section 11.6 for further explanation). If Triggers 7 and 8 are already set, the ENHANCE PARITY selection will not override the prior program.

10.4.4 REV IMAGE. When INTERFACE = ON is selected, another line of eight selections appears (Figure 10-9), consisting of seven leads and a marker. RTS is the default selection. All data received while the selected lead is on is displayed in reverse image.

One of six EIA interface leads may be directly selected. Any other EIA interface lead may be designated by selecting STRAP and patching the user-assigned pin to the desired lead. (See Tables 4-1 and 4-2 for strapping information.) If MKER is selected, all data received while the ENTER key is held down will be shown in reverse image.

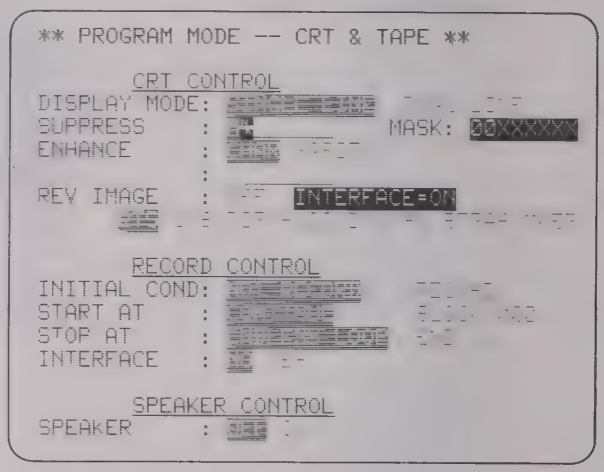

Figure 10-9

To suppress everything but characters that fit a certain bit mask, press NOT EQUAL, then BIT MASK. All characters that do not fit whatever pattern you enter for the bit mask will be suppressed, and the low-intensity M in the SUPPRESS list will have a horizontal bar through it, ~~M~~.

NOTE: If you wish to display a recorded interface lead or marker in reverse image, the lead or marker must be selected here when the data is played back.

10.5 RECORD CONTROL

The Record Control menu (Figure 10-9) does not appear if TAPE or TAPE/DTM has been selected as data source.

10.5.1 The first line under RECORD CONTROL is entitled INITIAL CONDition because, whether NOT RECORD or RECORD is selected, this condition may be altered by the SET TAPE selection on a trigger menu.

10.5.2 START AT selections are analogous to those for playback on the Parameters 1 menu.

NOTE: All tapes should be preformatted before use in the 3500. (See Section 12 for a complete discussion of tape block numbering and tape operation.)

Whether recording begins under trigger or manual control, if CONTINUE is selected recording will begin at the last block previously recorded.

When Block 000 is selected, recording begins at the first block of the tape, whether or not this entails writing over previously recorded data.

You may also choose to start recording at any other specified block. Thus you may avoid writing over old data altogether, or you may choose to write over any number of blocks of old data.

10.5.3 STOP AT offers the choice between beginning again at Block 000 when the tape is full, thus writing over previously recorded data (ENDLESS LOOP), and stopping at the last block on the tape (END).

10.5.4 INTERFACE: When INTERFACE: YES is selected, the status of six EIA leads (RTS, CTS DSR, RLSD, DTR, RI) and the user-assigned lead—if it has been strapped to an EIA lead—is automatically recorded. When the recorded data is played back, the status of these leads is then shown by the LEDs on the EIA indicator panel.

Data received while the ENTER key is held down will be marked. When the recorded data is played back, the marker can be displayed on the CRT in reverse image if INTERFACE = ON, MKER is selected under REV IMAGE on the Parameters 2 menu (see Section 10.4.4).

10.5.5 For more information on recording, see Section 12.

10.6 SPEAKER CONTROL

SPEAKER ON enables you to "hear the data." This selection should not be confused with the audible alarm, which is set on the trigger menus.

11 Triggers

An extremely powerful, yet very simple programming concept is employed in the trigger technique: Basically, you specify one or more conditions that you wish the trigger to look for and what ensuing action or actions you wish it to take. There are eight independent triggers in the 3000 Series INTERVIEW.

See Section 10.1 or Section 5 if you want to review using the cursor to make program selections and data entries.

In the Program Mode, press TRIGGER. A Trigger Summary (Figure 11-1) will be displayed. This will be

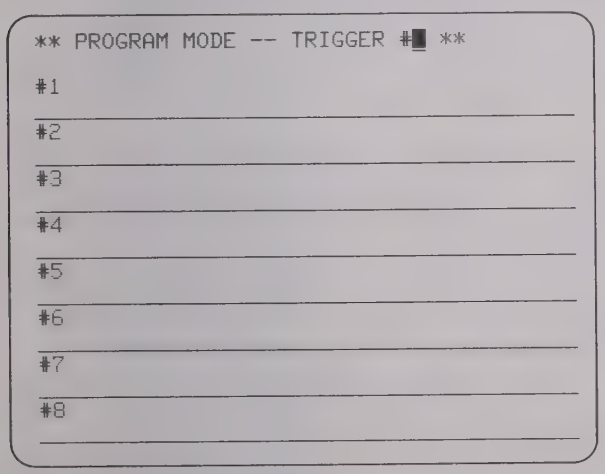

Figure 11-1

more easily understood after we have considered the individual trigger menus. Press the number 1 and the menu for Trigger #1 will appear; the Trigger #2 menu is obtained by pressing TRIGGER and 2; and so on (see Figure 11-2).

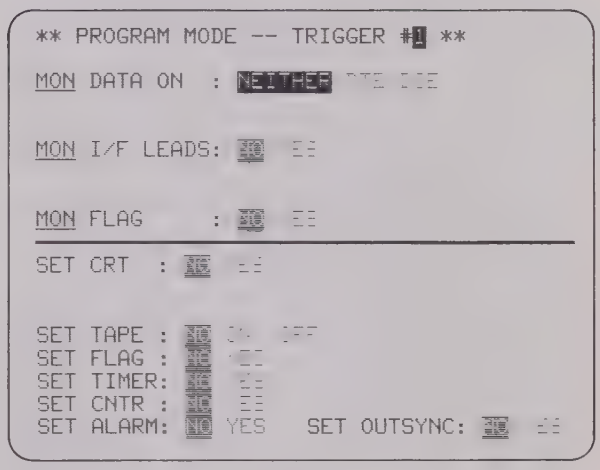

Figure 11-2

11.1 TRIGGER SOURCES

Each of the eight Triggers may look for any or all of three sources: (1) data character combinations; (2) interface lead configurations; and (3) an internal flag that permits triggers to be linked or made dependent on one another. (See Figure 11-3.) *All sources selected must become true for a trigger to take action.*

11.1.1 Monitor Data. A trigger will look for data from the DTE (Data Terminal Equipment) or from the DCE (Data Communications Equipment), or can remain quiet and look for NEITHER DCE nor DTE data.

When DTE or DCE has been chosen, you can instruct the trigger to look for (a) a string of up to eight characters; or (b) any one of a group of up to eight char-

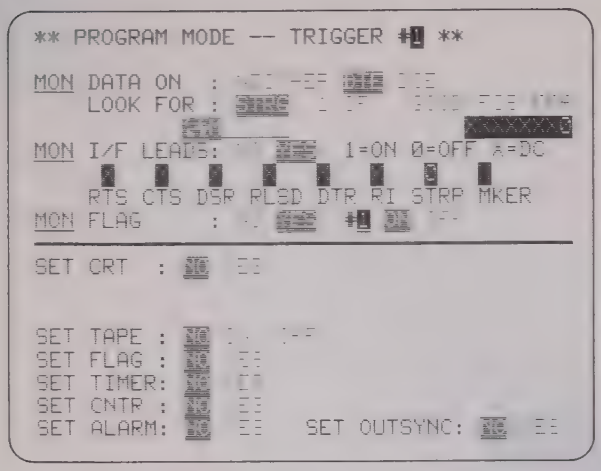

Figure 11-3

acters; or (c) for Bit-Oriented Protocols (BOP), a good FCS or an FCS error.

(a) *Character String.* You may enter up to eight characters directly from the keyboard in the desired sequence. The characters may include—

- Upper- or lower-case alpha characters or numerals
- Control characters
- HEXadecimal entries
- One BIT MASK (refer to Section 10.4.2), which enables you to specify each bit in the character as 1 or 0 or X (Don't Care).
- NOT EQUAL (refer to Section 10.4.2), modifying a character, decimal or Bit Mask entry so that the condition is satisfied by all other bytes *except* the one entered.
- DON'T CARE, which allows any character received to satisfy the condition (i.e., string position).

NOTE: Certain characters are displayed in low-intensity reverse image to indicate they are not literal characters but have another special meaning. These are Don't Care, DC; the HDLC *Flag,* $7E_{16}$ (see Section 14); and Bit Mask, M.

Any combination of these character types can be entered within a string. Only one Bit Mask is permitted in a string. The other types can be repeated in any order. The *Flag* may only be used as the first or last character in a string (see also Section 14).

The string search is reevaluated after each character is received. This "sliding" string will always detect a correct match even when an exit "error" character still satisfies a shorter sequence of the string. Most other techniques would require restarting the string search at the first (or second) character into the string after an exit on an error character.

NOTE: All eight trigger string detectors are active at the same time.

(b) *"1 OF" Character Entry.* Often one needs to detect any one of several characters. For example, a valid response may be any one of EOT, NAK, ACK, SOH, and DLE.

Up to eight characters may be entered, from the same list as for strings. Only one character should be entered if it is a DON'T CARE. If all characters are entered as NOT EQUAL, a match is found on each character that is not any one of the characters entered.

(c) *FCS.* When the 3500 is in the BOP format (HDLC framing, 7E *Flags*), the FCS is automatically verified for each frame. A GOOD FCS or an FCS ERROR can be selected as trigger source. (See Section 9.7 for a discussion of how good and bad FCS are indicated in Monitor Mode.)

In Monitor Mode, an abort within a frame is indicated on the CRT (Section 9.7). However, an abort is not directly available as a trigger source.

11.1.2 Monitor Interface Leads. Each trigger will look for a specific combination of EIA interface lead status. It will detect lead status within one character time of actual occurrence.

Any of the six preassigned leads may be ON or OFF or ignored as the pattern of interest. The six preassigned leads are RTS, CTS, DSR, RLSD, DTR, and RI. One unassigned lead, STRP, is available, which can be strapped to any EIA lead (see Tables 4-1 and 4-2).

The eighth selection, MKER, is not a lead, but a marker which senses either the ENTER key or a marker that has been recorded on tape (see Section 10.5.4).

11.1.3 Monitor Flag. Triggers are normally independent of one another, but internal flags can be used to make one trigger dependent on another. There are eight flags available.

For an example of how internal flags can be used, consider the requirement to count the number of characters in a message, that is, between STX and ETX.

As an example (see Figures 11-4 through 11-6), let us set Trigger 1 to turn Flag 1 ON upon receipt of STX, and Trigger 2 to turn Flag 1 OFF when ETX is received. If we then set Trigger 3 to INCrement Counter 1 every time a Don't Care (X) character is received while Flag 1 is ON, all characters in a message will be counted.

To select a flag, select MON FLAG: YES, which expands the display to request a flag number (from 1 to

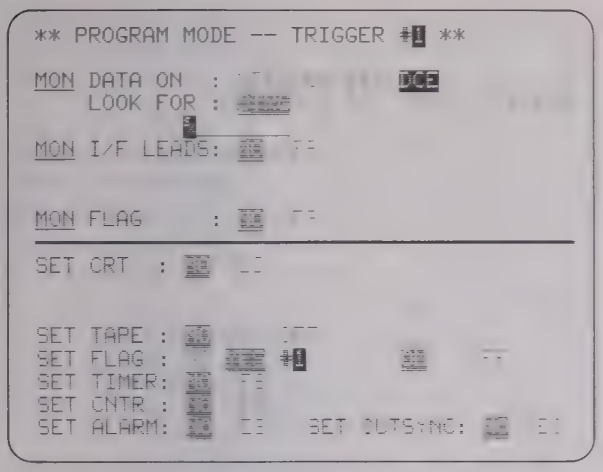

Figure 11-4

8) and whether the flag is ON or OFF. On the summary (Figure 11-7), Flag OFF is designated with a horizontal strike: ~~FLAG.~~

NOTE: Remember that the string detector is in constant operation. This means, for example, that if the string is present at the moment a flag (or interface) condition is satisfied, the trigger will take immediate action. If a trigger is set to look for both a flag and a string, it does not wait for the flag (or the interface) condition, if that has been selected) before beginning the character string search.

11.2 TRIGGER ACTIONS

Any combination of up to seven actions (see Figure 11-8) can be set to take place when a trigger has found the condition(s) it is looking for. For example, a NAK could freeze the CRT, increment a counter, and set the audible alarm.

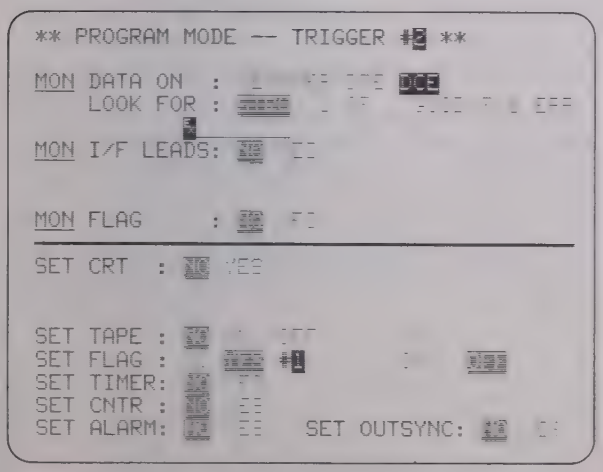

Figure 11-5

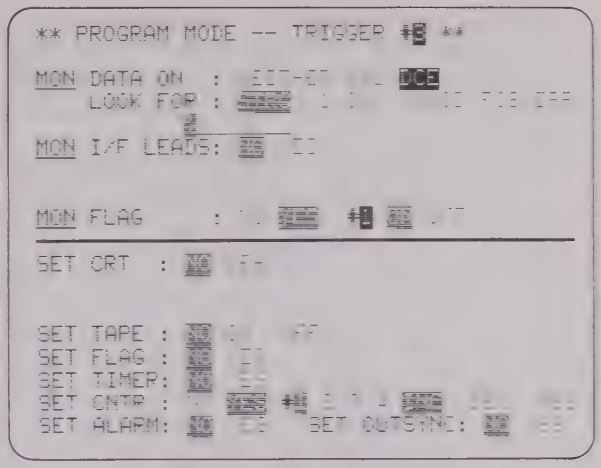

Figure 11-6

More than one trigger has access to set the same action. For example, a counter may be used in one trigger to count DTE data characters and the same counter used in another trigger to count DCE data characters, thereby giving a total of all data characters on both circuits.

At data speeds up to 9600 bps, all trigger actions occur within the next received character time. As the speed is increased up to 64,000 bps, the number and complexity of triggers that can be used is reduced. Trigger efficiency is also influenced by the type of data.

When you select YES for a trigger action, the action criteria are presented. If you then select NO, the criteria will disappear from the display, but will remain dormant in the unit. When the program is recorded, the dormant choices will also be saved on the tape for future use. These choices will reappear if YES is again selected. They can be cleared, and the entire trigger returned to the default (OFF) state, by CONTROL plus CLEAR FIELD.

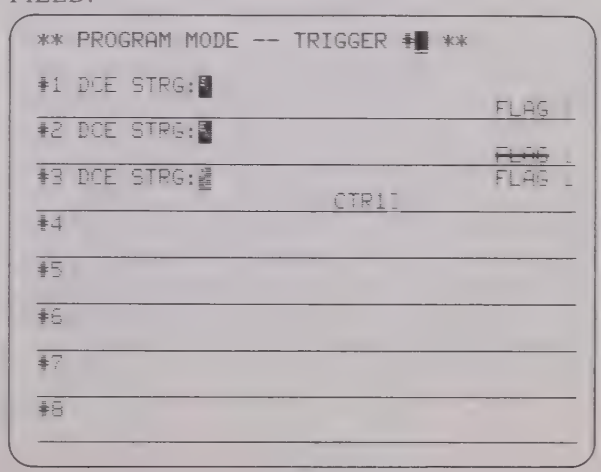

Figure 11-7

NOTE: If you manually freeze the CRT while triggers are programmed, be careful to restore data flow with the RESUME TRIGGER key, not MANUAL UNFREEZE; otherwise when the data flow resumes the program will be inoperative.

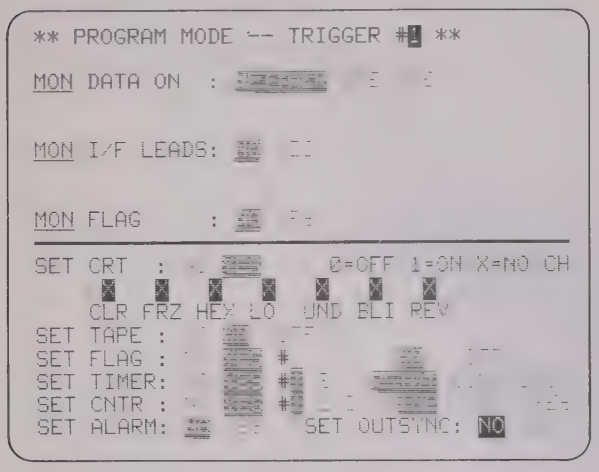

Figure 11-8

11.2.1 CRT. Triggers can be used to selectively enhance or display the specific data of interest on the CRT. This capability avoids using valuable time to look for random occurrences.

Control of the CRT is independent of the tape or the counters or timers. Data withheld from the display while it is frozen is still available to be recorded and counted. The 640-character display and the 1920-character display buffer are controlled together.

Seven conditions of the CRT display can be controlled by a trigger. Any combination is permitted.

(1) CLEAR causes the CRT display and the entire contents of the 1920-character buffer to be cleared. This process requires 20 milliseconds, during which any data characters received will be lost to the CRT display. CLEAR need not be turned OFF with a trigger: it automatically resets itself to OFF when the clearing process is completed.

(2) FREEZE suspends display of data characters. Generally one trigger is used to select the FREEZE ON condition and another trigger is set to turn FREEZE OFF. An example is to turn Freeze OFF (e.g. begin to display data) upon receipt of a given address and to turn Freeze ON upon termination of the transmission in order to selectively display traffic to a specific address.

When a trigger freezes the display, the TRIGGER and FREEZE LEDs in the CRT STATUS zone of the panel go ON. This clearly indicates why the display is static.

You may override the Trigger Freeze by operating the MANUAL UNFREEZE key. All data will be displayed and the panel CRT status LEDs marked MANUAL will be ON.

Trigger Freeze control may be restored with the RESUME TRIGGER key.

(3-7) CRT highlights (HEX, LO, UND, BLI, REV) are attached to the characters as they are placed in the display buffer. They cannot be overridden without changing the trigger.

Note: CRT display highlights are not individually applicable to DCE or DTE. For example, all data received will be REVerse image until REV is turned OFF by another trigger.

(3) HEX: When this characteristic is selected, all received data is displayed in hexadecimal. The HEX key will not reconvert the data to text: once data is received in the display buffer as HEX under trigger control it will remain HEX.

(4) LO: Low intensity is useful to display data of lesser interest. But low intensity in combination with REVERSE creates a highlight that is easily noticeable.

(5) UND: Underline is an added enhancement; however, care should be used to avoid confusion with the underline for DCE data.

(6) BLI: Blink is useful to call attention to a small portion of data. In combination with REVERSE, BLINK gives the highest level of attention attraction. When the entire screen is REV and BLINK, the display will change size and "bloom."

Blink cannot be reset or overridden by the operator.

(7) REV: Reverse image causes characters to be presented in black on a white background. You should avoid having many characters displayed in reverse image at the same time as this condition is difficult to read.

11.2.2 TAPE. Trigger control of the tape permits selective recording, of a specific terminal's responses, for example.

When the SOURCE of data is the tape, TAPE is deleted from the trigger display.

When the tape is turned ON, the preceding 16 characters (128 bits) are automatically recorded too. When the tape is turned OFF, the following 16 characters (128 bits) are automatically recorded. Therefore, when triggers turn the tape OFF and then ON within less than 32 characters, the data is recorded continuously without an interruption.

When data is being recorded under trigger control, the panel status LEDs marked TRIGGER and RECORD are ON. You may override the triggers from the keyboard using the MANUAL START or MANUAL STOP key in the CAPTURE MEMORY zone. RESUME TRIGGER must be used to restore trigger control. The panel status LEDs will show all changes in status.

See Section 12 for a complete discussion of 3500 tape use.

NOTE: Use the ENTER key to move the cursor to the number and action fields for Flag, Timer, and Counter.

11.2.3 FLAG. Internal flags may be set ON or OFF. Section 11.1.3 describes the use of flags to interrelate triggers.

11.2.4 TIMER. Two timers are provided. Each timer may be controlled in three ways.

(1) ReSTaRT causes the selected timer to reset to 0 and begin counting.

(2) CONTinue causes a timer to begin counting by adding to the existing count. This permits an accumulation of time for network performance measurements, for example, the aggregate time that station H is active on the network.

(3) STOP causes a timer to stop. The timer value will be displayed on the RESULTS display until the next ReSTaRT or CONTinue trigger or until manual intervention.

The maximum value for each timer is 65,535. When this is exceeded, OVFLOW appears on the Results display (Monitor Mode). Timers may be reset in Monitor Mode (see Sections 8.5.2 and 8.5.3). Timer resolution can be selected on the Statistics menu (Section 11.5) as milliseconds or seconds. Timers may also be named on the Statistics menu.

NOTE: When 1 second is used for the count increment and the durations are less than 1 second, a rounding effect occurs, where some shorter periods are missed and others counted. This effect will usually average out for counts above 100. Since the 1-second timebase runs continuously and is not initialized for each measurement, the accuracy of measurements will always be ± 1 second.

NOTE: Remember that in tape playback mode, the timer readings are valid only if the data is played back at the original line speed. Otherwise, a correction must be made: for instance, 2 ms at 4800-bps line speed is equivalent to 1 ms at 9600-bps playback speed.

11.2.5 COUNTER. Four counters are provided. Several triggers can control the same counter. Each counter can be set in three ways:

(1) INCrement: Each trigger occurrence adds one (1) to the counter. The menu defaults to INCrement because this is the most often used selection.

(2) DECrement: Each trigger occurrence subtracts one (1) from the counter.

(3) RESET resets the counter value to 0.

Maximum count of each counter is 65,535; minimum is 0. When either limit is passed, OVFLOW appears on the Results display. Counters may be reset in Monitor Mode (see Sections 8.5.2 and 8.5.3). They may be named on the Statistics menu (Section 11.5).

11.2.6 ALARM. The alarm is a multiple beep each time the trigger occurs. It is useful for calling your attention to the unit, especially when the situation of interest occurs infrequently. Used in combination with FREEZE, the alarm frees you to tend to other chores: Whenever the data is frozen on the CRT for analysis, the alarm will sound.

11.2.7 OUTSYNC. This trigger causes the selected DTE or DCE receiver to go out of synchronization. While the receiver is out of sync, no data from that side of the line is presented to the 3500 display or counters or timers. However, all data is still recorded on tape.

This capability is useful when the information after a header group is of no interest, but you need to see data on the other side of the line. In this case, FREEZE would not be applicable since it inhibits addition of all data to the display.

When ASYNC is selected, OUTSYNC is deleted from the menu.

11.3 TRIGGER SUMMARY

For the convenience of the operator a condensed summary of all eight triggers is available on one menu. Figure 11-9 is an example. This display is also available in Monitor Mode as Program Summary.

Certain simple conventions are used in order to condense the display.

1. For each trigger, all trigger source conditions are shown on the top line and all trigger actions are shown on the lower line, thus maintaining the same division used on the trigger menus.

2. When there is no trigger condition to look for, the trigger actions are deleted from the summary, although they remain on the menu.

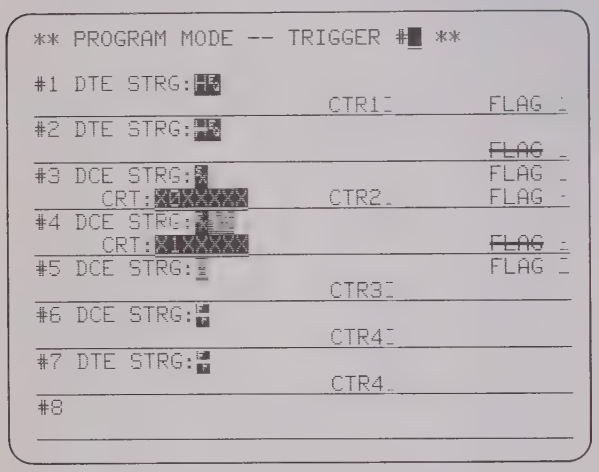

Figure 11-9

3. All nonselected conditions are deleted from the display.

4. When the condition selected is OFF, it is displayed with a horizontal bar through it.

5. When BIT MASK is programmed, it is shown by a low-intensity reverse M. The expansion is not shown.

Appendix D is a Trigger Summary Work Sheet suggested for use in devising programs for your 3000 Series INTERVIEW. Copies are available from Atlantic Research.

11.4 TRIGGER TIMING and SEQUENCE

Although all triggers are simultaneously active, there is an order in which they are processed. The order of trigger processing is significant only in special situations (as in Section 11.4.2).

11.4.1 Basically, all triggers are first evaluated in order (1 to 8) for their condition to be true; then the trigger actions are taken in order (1 to 8). This process permits the same internal flag to be sensed and set by the same trigger.

The sequence that occurs after each character is received is as follows:

(1) Evaluate triggers that do not look for data.
(2) Evaluate triggers that look for DTE data.
(3) Evaluate triggers that look for DCE data.
(4) Set all actions applicable for each trigger in order (1 to 8).

11.4.2 Usually the timing described in Section 11.4.1 is not important. However, under certain circumstances, such as when internal flags are being set and tested, these timing relationships are significant.

Consider the case in which a string on the DTE line sets a flag; another DTE string resets the flag; and that flag in conjunction with a DCE string turns on the tape. Figure 11-10 shows the Trigger Summary for this example. Trigger 1 looks for a string, BC, on the DTE side of the line and turns Flag 1 ON when the string is found. Trigger 2 looks for a string, DE, on the DTE side and turns Flag 1 OFF when the string is found. Trigger 3 looks for Flag 1 to be ON in conjunction with a *DCE* string of HI and turns ON the tape when this condition is met.

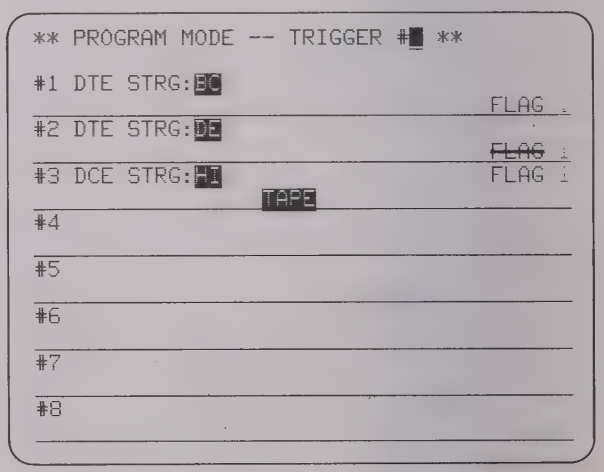

Figure 11-10

Suppose that the following data is received and shown in dual-line display on the CRT:

DTE — A B C D E F
DCE — G H I J K L

Before we consider what the program of Figure 11-10 will do with this data, we must understand how this data may have been received. First, the time correlation between the DTE and DCE lines on the display is accurate to ±1 character. Second, the display has a resolution, at the very best, of only 1 character. Thus, the two lines may actually be skewed by half a character or even one bit, but this cannot be shown on the display. Third, the program processes characters within microseconds after they are received. Thus, two characters that appear on the screen to have been received simultaneously may not have been treated that way by the program.

Our sample program is looking for a string of BC on the DTE line and HI on the DCE line. On the display, these characters appear to have been received simultaneously, but actually string BC may have been received (1) before, (2) after, or (3) simultaneously with string HI. We now consider what action would be taken in each of the three cases.

(1) BC String Received before HI String: The Trigger 1 conditions and actions are processed before the Trigger 3 conditions and actions. Thus, when BC is received, Flag 1 is turned ON. When HI is received Flag 1 is already ON and the Trigger 3 conditions are met, so the tape is turned ON.

(2) BC String Received after HI String: Trigger 1 conditions and actions are processed after the Trigger 3 conditions and actions. Thus, when the HI string is received, Flag 1 has not yet been turned ON and the Trigger 3 conditions are not met, so the tape is not turned ON.

(3) BC and HI Strings Received Simultaneously: For this case, we must consider the trigger timing discussed in Section 11.4.1. Remember that all trigger conditions are tested before any of the actions are taken. First, the string BC on the DTE line is checked and found to be true, but no action is taken yet. Next, the string HI on the DCE line is evaluated, but since the Trigger 1 action has not yet been taken, Flag 1 has not been turned ON and the Trigger 3 conditions are not met.

Now that all of the conditions have been evaluated, the actions will be taken. The Trigger 1 condition having been met, the Trigger 1 action is taken first, so Flag 1 is now turned ON. Because the Trigger 3 condition has not been met, the Trigger 3 action is not taken, so the tape is not turned ON. In this case, even though Flag 1 has been turned ON, the tape is not, because the flag was not turned ON until after the Trigger 3 condition was tested.

Thus we see that for the same CRT display two different actions may be taken by the program. This is due to the resolution limitations of the CRT. The program is executing within microseconds of receiving each character and with much better resolution than is possible on the CRT.

11.5 STATISTICS

The Statistics display (Figure 11-11) is used to enter the descriptive names and (or) functions of the counters and timers that are programmed using the triggers. Alphanumeric and control characters are legal in the name field, but hexadecimal entries are not permitted.

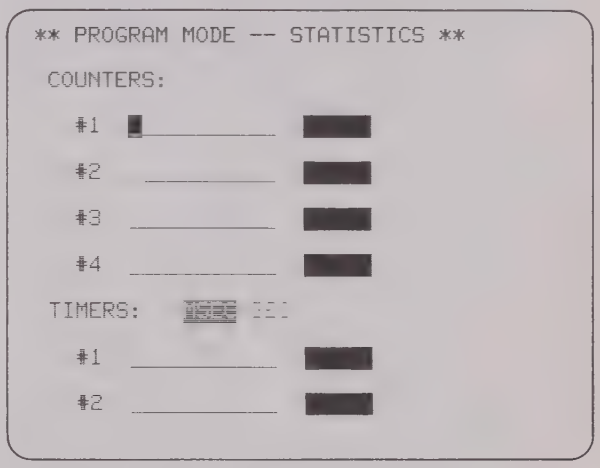

Figure 11-11

Timers may be set to increment in seconds or milliseconds on this menu. The default selection is milliseconds.

In Monitor Mode, the RESULTS key obtains this same display but with real-time counter and timer readings displayed.

11.6 COUNTING PARITY ERRORS: TRIGGERS 7 AND 8

When ENHANCE PARITY is selected on the Parameters 2 menu of the default program (see Section 10.4.3), Triggers 7 and 8 are automatically set to count parity errors. Trigger 7 monitors parity on the DTE line and counts errors with Counter 3; Trigger 8 monitors parity on the DCE line and counts errors with Counter 4. (See Figure 11-12.) Counters 3 and 4 are appropriately named on the Statistics menu (Figure 11-13).

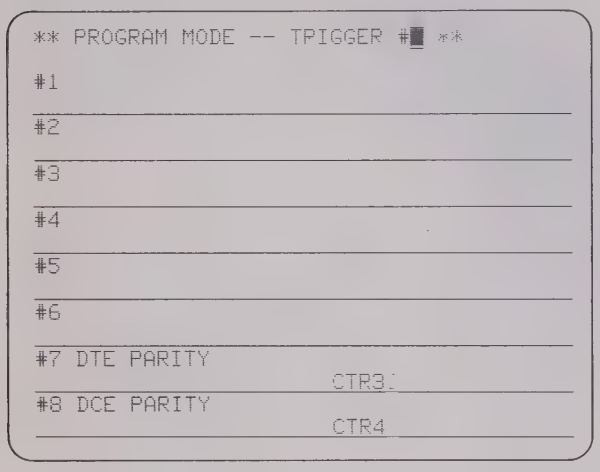

Figure 11-12

Note: When ENHANCE PARITY is cleared, the Trigger Summary lines for Triggers 7 and 8 may clear, but the SET CNTR lines on the trigger menus will not clear unless CONTROL plus CLEAR FIELD is operated while the appropriate trigger menu is displayed. This will always clear the entire trigger menu. If the program is recorded without clearing Triggers 7 and 8, the recorded program will include Counters 3 and 4 set to increment on Triggers 7 and 8.

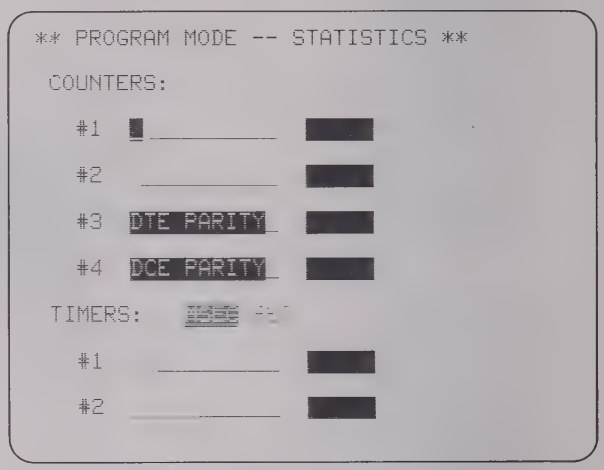

Figure 11-13

12 Recording

The 3500 can display a number of error messages concerning tape operations. These messages and their probable causes are listed in Appendix C.

12.1 PREFORMATTING OF TAPES

All new tapes should be formatted prior to use in the 3500, for two reasons. (1) When tapes are exposed to temperature changes or vibration, they may lose their tension. This results in faulty operation. Running a tape through one cycle, forward and reverse, will readjust the tension to its proper value. (2) Tapes must contain block numbers if they are to be recorded by sections rather than without interruption.

Be sure no signals are connected at the rear of the unit. The PRIMARY DATA TD and RD indicators in the EIA STATUS indicator zone *must be OFF*.

Set up the Parameters 1 menu as follows:

SOURCE:	LINE
MONITOR:	BOTH
CODE:	EBCDIC
FORMAT:	SYNC
SYNC CHARS:	FF FF_{16}
OUT SYNC:	OFF
AUTOSYNC:	OFF
INT CLOCK:	9600

On the RECORD CONTROL (Parameters 2) menu, select:

START:	BLOCK 000
STOP:	END

Position the tab on the new tape to RECORD and insert the tape. Press the MONITOR key, and observe the CRT.

When BLOCK 000 appears, operate MANUAL START in the CAPTURE MEMORY zone. After about 3 minutes the block counter will stop incrementing near 250. The tape is now formatted. All 250 blocks are on the tape, filled with idle mark.

12.2 RETENSIONING TAPES

If a recorded tape that is to be used for analysis has not been kept in a controlled environment, it should be retensioned before use.

On the Parameters 1 menu, select

SOURCE:	TAPE
START AT:	BLOCK 100
MONITOR:	BOTH
SPEED:	9600

and the correct parameters for the data on the tape. Other menus should be in default condition.

Position the tab on the recorded tape to the protected position (toward the center of the tape) and insert the tape.

Press MONITOR. The tape should move to Block 100; then begin to play back data.

Press PROGRAM and on the Parameters 1 menu, select START AT: BLOCK 000. Return to MONITOR. The tape will move back to Block 000 before it begins to play data.

12.3 DATA RECORDING: CAPTURE MEMORY

12.3.1 General. When LINE or DTM has been selected for the data source on the Parameters 1 menu, the received data may be recorded on the tape. The only

other menu requirement to enable recording is the proper CLOCK selection (Parameters 1). With clock provided via the RS-232 interface, EXT CLOCK permits recording whether or not data is displayed on the CRT, and whether the data is SYNC or BOP or isochronous (ASYNC with external clock). When clock is *not* supplied via the RS-232 interface, INT CLOCK and the correct data SPEED must be selected.

EIA interface lead status is recorded only if programmed (see Section 10.5).

If the RECORD tab on the tape is OFF recording will not take place.

The tape must be inserted *before* Monitor Mode is selected.

When the tape is turned ON, the preceding 16 characters (128 bits) are automatically recorded too. When the tape is turned OFF, the following 16 characters (128 bits) are automatically recorded. Therefore, when the tape is turned OFF and then ON within less than 32 characters, the data is recorded without interruption. (See Figure 12-1.)

When data is being recorded, the RECORD indicator on the status panel goes ON and the tape BLOCK number on line 1 of the display increments for each block received. There are 250 to 260 blocks on a tape. One block contains 2400 characters (1200 from each side of the line) when interface status is not recorded. If interface status is recorded, each block contains 1600 characters (800 from each side of the line) plus 800 interface samples.

If the tape has not been preformatted, block numbers are assigned as the data is recorded: then only the portion of tape that has been recorded will contain block numbers.

Because the tape is double buffered, incoming data is not immediately recorded. To ensure that all desired data has been transferred from the buffer before recording stops, allow the tape to record one more block number after all wanted data has been received.

Suggestion: To avoid overwriting and facilitate finding data later, allow 10 block numbers between the end of one section and the beginning of a new section of data.

NOTE: Recording will not take place if clock is not being received on both TD and RD leads. This could occur, for instance, when a modem is set for New Sync. In this case, INTernal CLOCK and the correct data speed must be selected on the Parameters 1 menu.

Recording will not take place if there is a split-speed condition, that is, different speeds on the TD and RD lines.

12.3.2 Manual Control. To record line data manually, only two keys are required.

(1) Position the record tab of the tape toward the outside edge of the cartridge.

(2) Enter Monitor Mode; operate the MANUAL START key in the CAPTURE MEMORY zone of the keyboard.

(3) The RECORD and MANUAL indicators on the status panel will go ON and the tape BLOCK number on line 1 of the display will increment.

(4) To stop recording, press MANUAL STOP (CAPTURE MEMORY zone).

12.3.3 Automatic Control: Parameters 2 Menu. Data recording may be initiated and stopped automatically upon entering and leaving Monitor Mode by using the RECORD CONTROL selections on the Parameters 2 menu (Section 10.5). This menu also must be used to record EIA interface status.

12.3.4 Trigger Control. When the data source is LINE, recording may be started and stopped under trigger control. The TRIGGER indicator in the CAPTURE MEMORY zone of the front panel will be ON (see Section 11.2.2). The RECORD indicator will flash ON and OFF to indicate the actual status of the recording process as the triggers control it.

12.3.5 Manual Override. Control by the Parameters 2 menu or triggers may be overridden by MANUAL START or MANUAL STOP (CAPTURE MEMORY group). The MANUAL status LED in the CAPTURE MEMORY zone of the front panel will go ON. To return the tape to trigger control, press RESUME TRIGGER (CAPTURE MEMORY group). The MANUAL LED will go OFF and the TRIGGER indicator will go ON.

12.3.6 Marker. The marker is included with the INTERFACE lead group and is enabled and disabled on the Parameters 2 menu. Select INTERFACE: YES under RECORD CONTROL on the Parameters 2 menu. Then, while data is being recorded, the marker senses the ENTER key status, and is recorded. See also Section 10.4.4.

12.4 PROGRAM RECORDING

CAUTION: Always verify that a tape has been preformatted, or that the program it contains is no longer of interest, before saving a program on it. The tape must be checked before the program is developed in the 3500 to avoid the possibility of writing over the new program with whatever may be on the tape.

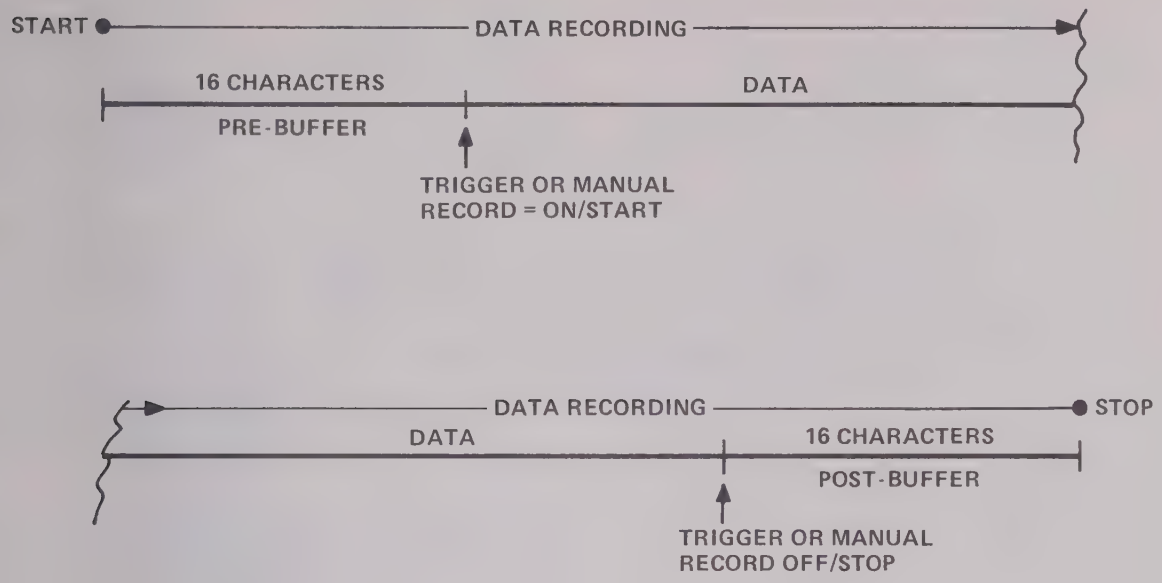

Figure 12-1

12.4.1 Tape Check

1. Ascertain that, if the unit contains a program, it is no longer of interest.

2. Insert the new tape; operate PROGRAM; and LOAD PROGram: the Parameters 1 menu with the name of any resident program or the PROGRAM SELECTIONS menu with NO PROGRAM FOUND will be displayed.

3. Remove the tape cartridge and position the RECORD tab toward the outside of the case (record position).

12.4.2 Saving a Program

(1) Develop the desired program in the 3500.

(2) Position the RECORD tab on the new cartridge to the outside of the case and insert it in the 3500.

(3) Operate PROGRAM; the PROGRAM SELECTIONS menu will appear. Press the SAVE PROGram key.

(4) Verify that the program has indeed been transferred to the tape:

a. Operate LOAD PROGRAM. The Parameters 1 menu with the program ID should appear.

b. If the tape is faulty, the message CHECKSUM ERROR will be displayed. In this case, the original program in the 3500 will not be disturbed. Repeat SAVE PROG and then LOAD PROG. If the error message repeats, the tape head may need cleaning, or the tape may be defective and should be discarded.

c. Also verify the Parameters 2 menu, all the Trigger menus, and the Statistics display.

(5) Remove the tape and position the record tab to the center of the case to protect the tape.

(6) Fill out a label with the program title and parameters and attach it to the cartridge. Prefold the label on the perforated line before peeling it off the backing.

12.5 DUPLICATION OF TAPES

Duplication of an INTERVIEW 3500 tape requires two separate operations: (1) duplication of the program; (2) duplication of the data.

12.5.1 Programs. To duplicate programs, simply repeat the SAVE PROGRAM procedure of Section 12.2 as many times as necessary. Be sure to go through the verification procedure for each duplicated tape before you remove it and insert the next tape. This also insures that the correct program is available in the unit for saving on the next new tape.

12.5.2 Data. Duplication of data tapes requires two 3500 units and a Tape Output Cable, OPT-895-09-L, to carry the signals to be recorded.

(1) One 3500 is used to play the source tape. Con-

nect the Tape Output Cable from the auxiliary connector of the source 3500 to the RS-232 line input connector on the second 3500. This cable carries the signals to be recorded from the source to the recording 3500.

(2) Program the source 3500 to play back the taped data, that is, select TAPE as source and the other parameters appropriate for the data. Select a speed; 9600 bps is recommended.

(3) Program the recording 3500 on the Parameters 1 menu to receive LINE data; otherwise, select the same basic parameters as programmed in the source 3500. This is easily done by loading the program from tape, and changing SOURCE to LINE.

(4) Program the recording 3500 on the Parameters 2 menu to RECORD, starting at BLOCK 000 and STOPping at END.

(5) If the RS-232 lead status was recorded with the taped data, the source unit will automatically output lead status in the playback. If you wish lead status to be recorded on the new tape, select INTERFACE: YES on the Parameters 2 menu of the *recording unit.*

(6) Position the record tab on the source tape to the protected position and insert the tape in the source unit (if it is not already in place).

(7) Position the record tab on the new tape to RECORD position and insert it in the recording unit.

(8) Start the source tape playing (press MONITOR) and observe the CRT of the recording unit.

(9a) On the recording unit, as soon as you see data displayed, operate MANUAL START in the CAPTURE MEMORY zone.

(9b) (Alternate Procedure) The recording 3500 can be synchronized by using a trigger to start the tape recording at the first non-FF character (for synchronous data), or the first *Flag,* non-*Flag* sequence (for BOP, HDLC), or any other specific data string on the source tape.

Operate MONITOR on the recording 3500. When BLOCK 000 is displayed on the recording CRT, operate the MONITOR key on the source unit.

(10) The RECORD LED will come on and the BLOCK number will increment. Recording will continue to the end of the tape—Block number 255 to 260.

At 9600 bps, recording takes approximately 3.5 minutes.

Verification of the recorded tape can be accomplished by visual observation during playback. However, an easier method is to use triggers to count data specifics such as STX, ENQ, EOT on both the source tape and the new tape. There may be minor discrepancies in the two sets of counts because of the slight differences in the exact locations at which the counts are examined.

Some tapes may contain more blocks than others because of variation in tape length.

13 Interactive Operation With Intershake II

Chapter 13 is in preparation.

14 Bit-Oriented Protocols

The 3500 handles all bit-oriented protocols with HDLC framing and zero insertion, including X.25, SDLC, and BDLC. Transparent BISYNC framing is also available. The strings and Bit Mask capability permit diagnostics at both frame and packet level (and SNA). Acronyms are displayed for X.25, X.75, and BISYNC-framed X.25 at both frame and packet level, and for all SDLC frame-control command bytes. (See Section 9.7 for a discussion of these protocols in Monitor Mode.)

The X.25-SDLC Training Manual and Training Tape treat the subject in depth.

14.1 FLAG KEY

Flag bytes, $7E_{16}$, must be entered using the special FLAG key at the right of the keyboard: press CONTROL plus FLAG simultaneously. In both the Monitor Mode displays and all the Program Mode menus, the *Flag* byte will be displayed as a low-intensity reverse-image 7E to distinguish it from transparent data 7E. *NOTE: The logic will read the key sequence HEX, 7, E as a data 7E, and not as a Flag byte.*

14.2 HDLC FRAMING

14.2.1 Basic Parameters. On the PARAMETERS 1 menu, select BOP for the FORMAT. For SDLC, select either BOP or BOP/NRZI. Normally, systems using NRZI do not use modem clock, so the operator must select clock rate. In some systems, NRZI is used with modem clock and EXTernal clock should be selected.

14.2.2 Strings. In HDLC framing, the FLAG key can be used in a string to establish the beginning or the end of a frame. For example, the key sequence FLAG, NOT EQUAL, FLAG, BIT MASK can be used to detect the frame-control byte bit pattern of interest. *NOTE: A Flag byte cannot be used individually in the interior of a string.*

Use NOT EQUAL, FLAG instead of DON'T CARE in cases where you must prevent a byte from being interpreted as another *Flag* (e.g., where there are idle *Flags*).

The 3500's BIT MASK capability can be used to enter a packet-type octet, an LCN, and so on. Remember that the low-order, rightmost bit in the bit mask is the first serial bit, Bit 1. The general lack of consistency in the literature with regard to bit numbering and order is frequently a source of error.

Known bytes can easily be entered in hexadecimal.

Entering a *Flag* for the last byte in a string permits the two FCS bytes and the five preceding bytes to be examined.

14.2.3 Frame Analysis.

(1) To count information frames, use the string FLAG; NOT EQUAL, FLAG; BIT MASK with Bit 1 = 0 (XXXX XXX0).

(2) To count supervisory frames, use the string FLAG; NOT EQUAL, FLAG; BIT MASK with Bit 2 = 0 and Bit 1 = 1 (XXXX XX01).

(3) To count nonsequenced frames, use the string FLAG; NOT EQUAL, FLAG; BIT MASK with Bit 1 = 1 and Bit 2 = 1 (XXXX XX11).

14.2.4 Packet Analysis for LCN. FLAG; NOT EQUAL, FLAG; DON'T CARE; HEX, (enter LCN in hex); HEX (enter second LCN byte in hex); BIT MASK with Bit 1 = 0. An alternative is to use the bit mask for

Octet 1 and enter the information byte hexadecimally if the Q bit is active. (Bit 8 of Octet 1 is the Q bit and should be DC in the bit mask.)

14.2.5 To Display All Packets to an LCN. FLAG; NOT EQUAL, FLAG; DON'T CARE; BIT MASK for Octet 1; HEX (enter second LCN byte in hex) for Octet 2.

Set a trigger to unfreeze (FRZ OFF = 0) upon receipt of the above string. Set a second trigger to look for a *Flag* byte on the same side of the line (DCE or DTE) and turn FRZ ON = 1.

Only information frames will be displayed, and the display will begin with Octet 3. Therefore the automatic packet-type mnemonic expansion using the P key will not function. (See Section 9.7 for more details about the display.)

Use MANUAL UNFREEZE to override trigger freeze and view *all* network communication. Use RESUME TRIGGER to permit the trigger to again selectively freeze the display.

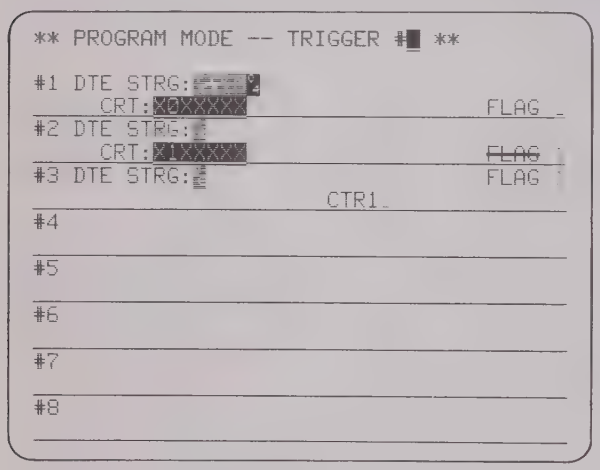

Figure 14-1

14.2.6 To Count Characters in Data Packets to an LCN. (Refer to Figure 14-1.) Use the triggers set up in Section 14.2.5 as a basis for a cumulative character count: Use the LCN detector trigger to also set internal Flag 1 ON and the *Flag* byte detector trigger to turn internal Flag 1 OFF. Set another trigger to look for one Don't Care character while internal Flag 1 is ON and set Counter 1 to increment.

To count the number of information packets, set a counter on the LCN detector trigger.

To count the characters per packet, use the *Flag* byte detector trigger to reset the data character counter.

14.3 BISYNC FRAMING

On the Parameters 1 menu, select SYNC for FORMAT. Enter two synchronization characters in hexadecimal, e.g. 32 32, or 16 16.

Selecting OUTSYNC on one pad (FF) will separate the frames. More pads can be used if there is the possibility that pads will occur in the data (as, for example, in a core dump).

Entering the synchronization characters in hexadecimal permits using *different* codes for framing and data. For example, there are now systems in operation that have EBCDIC framing (SYN = 32) with ASCII data, as well as ASCII framing (SYN = 16) with EBCDIC data.

In Monitor Mode, the automatic mnemonic expansions (see Section 9.7) are valid at both frame and packet level.

15 Auxiliary Interface

The auxiliary interface is accessible through the 50-pin connector on the rear of the unit. The Auxiliary Interface has two main uses: interfacing the 3500 to the DTM, and transmitting EIA level signals in the tape playback modes.

15.1 INTERVIEW-DTM

The 3500 has three different modes of operation when used with the DTM. These are the DTM, TAPE/DTM, and EDIT/DTM modes described in Section 13 of this manual. The pins used in these three modes are described below.

3500 Pin	Signal Name	DTM Pin	Description
1-10			Reserved for future use.
11	DTM AUX TX CLK I/O	95	1 LS TTL INPUT (SCHMIDT) w. 1000 pF to GND *EDIT/DTM Mode:* This pin inputs the 1 X clock generated by the DTM which is used to clock in the data in the DTM/EDIT mode.
12	DTM AUX TX I/O	94	1 LS TTL INPUT *EDIT/DTM Mode:* This pin inputs the data generated by the DTM in the DTM/EDIT mode.
13	DTM SERIAL RXT	90	LS TTL OUTPUT (SINK 8 mA) *TAPE/DTM Mode:* This pin is used to steer the transmitters and receivers in the DTM. In the TAPE/DTM mode, this pin is low; it disables the DTM transmitter and enables its receivers so that the DTM can receive data from the 3500.
14	DTM FI2	59	LS TTL OUTPUT (SINK 8 mA) *DTM, TAPE/DTM, and LINE Modes:* These pins are driven by Flags 6, 7, and 8. Output DTM FI1 tracks Flag 6 of the 3500; output DTM FI2 tracks Flag 7 of the 3500; and output DTM FI3 tracks Flag 8 of the 3500. When Flag 6, 7, or 8 is ON, the corresponding output will be high; and when Flag 6, 7, or 8 is OFF, the corresponding output will be low. These outputs, as their names imply, may be used to drive the FI1, FI2, and FI3 inputs of a DTM. They may also be used in the LINE mode as an external trigger for a scope or data recorder.
15	DTM FI3	60	
16	DTM FI1	58	

3500 Pin	Signal Name	DTM Pin	Description
17	AUX IN 1	—	1 LS TTL INPUT (SCHMIDT) for future use
18	AUX IN 2	—	
19	AUX IN 3	—	
26	DTM TD	86	LS TTL OUTPUT (SINK 16 mA) *TAPE/DTM Mode:* This pin outputs a bit-for-bit image of the data recorded on the tape from the TD side of the line.
27	DTM RD	87	LS TTL OUTPUT (SINK 16 mA) *TAPE/DTM Mode:* This pin outputs a bit-for-bit image of the data recorded on the tape from the RD side of the line.
28	DTM SCT	88	LS TTL OUTPUT (SINK 16 mA) *TAPE/DTM Mode:* This pin outputs a 1 X clock and is used to clock data from pin 26 into the DTM.
29	DTM SCR	89	LS TTL OUTPUT (SINK 16 mA) *TAPE/DTM Mode:* This pin outputs a 1 X clock and is used to clock data from pin 27 into the DTM.
30	DTM REV	68	1 LS TTL INPUT (SCHMIDT) w. 1000 pF to GND *DTM, TAPE/DTM, and EDIT/DTM Modes:* These leads are used to control the CRT enhancements and the tape of the 3500 from the DTM.
31	DTM BLINK	66	
32	DTM UL	71	
33	DTM CLEAR	73	
34	DTM TAPE	69	
35	DTM LOW	67	
36	DTM HEX	72	
37	DTM FRZ	70	

15.2 RECORDED SIGNALS

In both the TAPE and the TAPE/DTM modes of operation the recorded signals are played back out the 50-pin connector at EIA levels. The signals played back are described below.

3500 Pin	Signal Name	RS-232 Pin	Description
38	AUX TD	2	EIA OUTPUT *TAPE and TAPE/DTM Modes:* This pin plays back a bit-for-bit image of the data recorded on the tape from the TD side of the line.
39	AUX SCT	15	EIA OUTPUT *TAPE and TAPE/DTM Modes:* This pin outputs a 1 X clock for the data on pin 38.

3500 Pin	Signal Name	RS-232 Pin	Description
40	AUX RD	3	EIA OUTPUT *TAPE and TAPE/DTM Modes:* This pin plays back a bit-for-for image of the data recorded on the tape from the RD side of the line.
41	AUX SCR	17	EIA OUTPUT *TAPE and TAPE/DTM Modes:* This pin outputs a 1 X clock for the data on pin 40.
42	AUX RTS	4	EIA OUTPUT *TAPE and TAPE/DTM Modes:* These pins output the recorded EIA interface lead status and the status of the internal marker if Record EIA was selected when the tape was recorded.
43	AUX CTS	5	
44	AUX DSR	6	
45	AUX RLSD	8	
46	AUX DTR	20	
47	AUX RI	22	
48	AUX U/A	(STRAP)	
49	AUX MARKER	—	
50	AUX TXDA	—	EIA OUTPUT for future use

16 Maintenance and Service

The 3000 Series INTERVIEW requires a minimum of maintenance and adjustment to assure satisfactory, trouble-free operation.

Procedures suitable to be performed by the operator are described in Sections 16.1 and 16.2.

Setting the internal switches on the Line Interface Module (Section 16.3) and maintenance of the Tape Drive mechanism (Section 16.4) should be performed only under supervision of qualified service personnel.

The same holds true for troubleshooting (Section 16.5).

With the exception of the user adjustments described in Sections 16.2 and 16.3, all electrical adjustments are preset at the factory and should only require readjustment after extended periods of operation. The adjustments described in Sections 16.6 and 16.7 should only be performed if there is good reason to believe they are required, and *they should be attempted only by qualified service personnel.*

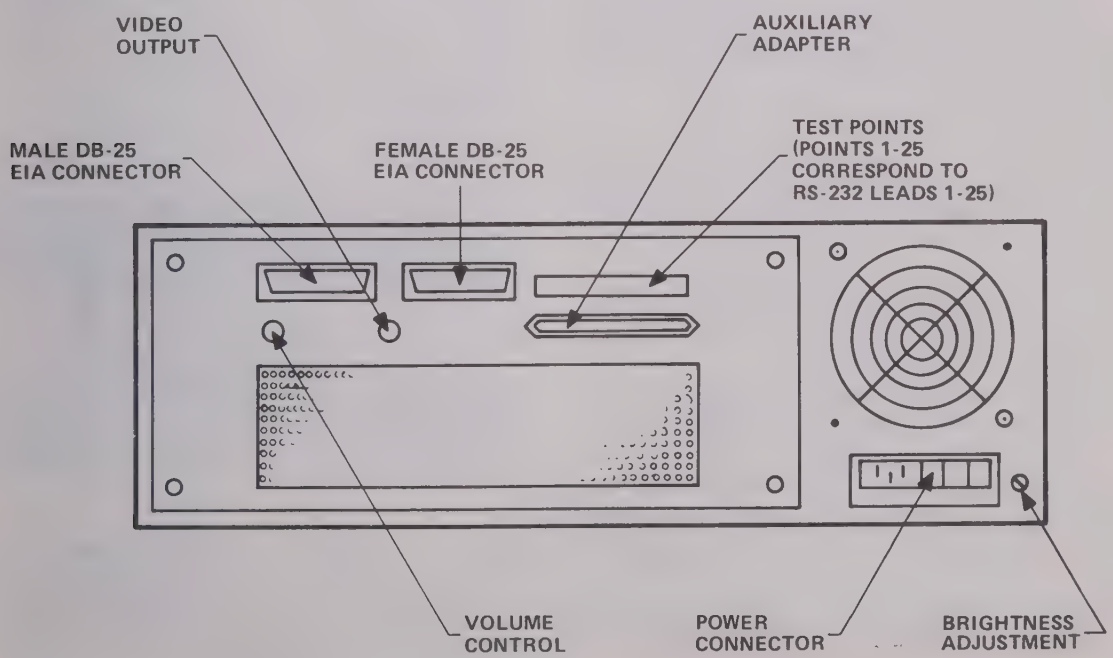

Figure 16-1 Rear panel of INTERVIEW 3500

16.1 GENERAL CLEANING

The exterior surfaces may be cleaned with a soft damp cloth. Accumulations of dirt or fingerprints may be removed from the case or keyboard using a cloth dampened with a mild detergent. Do not use abrasive or solvent-type cleaners, which may damage the plastic surfaces.

16.2 VOLUME AND BRIGHTNESS ADJUSTMENTS

This section covers adjustments that the operator may make to suit his particular operating environment or preferences. The speaker volume and CRT brightness controls are mounted on the rear panel (see Figure 16-1).

16.2.1 Volume. Volume may be adjusted to suit the user's needs or preferences, depending on the background noise level at the work site. The volume control is mounted on the rear panel and has a knob for easy adjustment. This control adjusts the volume of the key confirmation and error tones, the trigger alarm (Section 11.2.6), and the audible data monitor (Speaker; Section 10.6).

Rotating the volume control fully counterclockwise will silence all these audible indicators. The trigger alarm and the audible data monitor (Speaker) can be enabled or disabled separately by using appropriate menu selections.

16.2.2 Brightness. The CRT brightness adjustment has been preset at the factory for the optimum display brightness. If it becomes necessary to adjust the brightness, follow this procedure:

(1) Allow the CRT to warm up for at least 5 minutes.

(2) Depress the MONITOR key, and then the SELF TEST key. The display should appear as in Figure 16-2. (The CODE selection is unimportant for this purpose.)

(3) The brightness control is located on the rear panel next to the power connector-fuse holder and a small screwdriver is needed to turn it.

Observing the display, increase the brightness until defocusing occurs. This will be most noticeable in the area of high-intensity reverse-image characters and along the edge between this area and the low-intensity area to the right of it. The edge of the high-intensity reverse area will appear to "bleed" into the low-intensity reverse area.

(4) Now back the brightness adjustment down just to the point that the defocusing or bleeding is eliminated. This is the maximum usable brightness setting. A higher setting will degrade the clarity of the display. If a lower setting is desired for a low ambient light environment, be careful not to reduce the brightness to the point that the low-intensity characters are illegible.

16.3 INTERNAL SWITCHES

The settings of internal switch S1, located on the Line Interface Module, should be checked before the unit is operated.

Loosen the four captive fasteners on the rear panel of the unit (Figure 16-1); pull out the panel and its attached board, sliding it in parallel with the top cover.

Check the settings on the switch S1 at location J6 in the center of the board (see Figure 16-3):

S1-1, ON
S1-2, OFF
S1-3, ON for EIA RS-232 (MARK = negative)
OFF for MIL-188 (MARK = positive)
S1-4, OFF if INTERVIEW 3500
ON if INTERVIEW 3000
S1-5, OFF
S1-6, OFF
S1-7, OFF
S1-8, ON for 60-Hz power frequency
OFF for 50-Hz power frequency

Check to see that the other PC boards are correctly seated in their connectors and card guides, and then install the line interface module. Make sure that it engages in its card guides and seats properly in the connector before you tighten the captive screws.

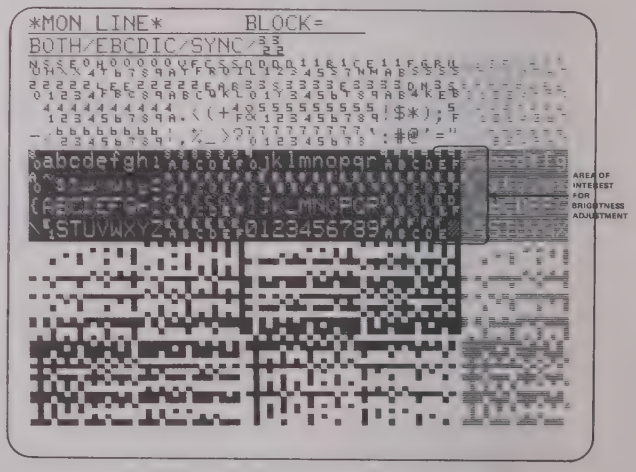

Figure 16-2 SELF TEST key (character font) display. EBCDIC code is shown here, but the SELF TEST key will display whatever code has been selected on the Parameters 1 menu. The HEX key will convert this display to hexadecimal, and CONTROL plus HEX will convert control characters to hexadecimal.

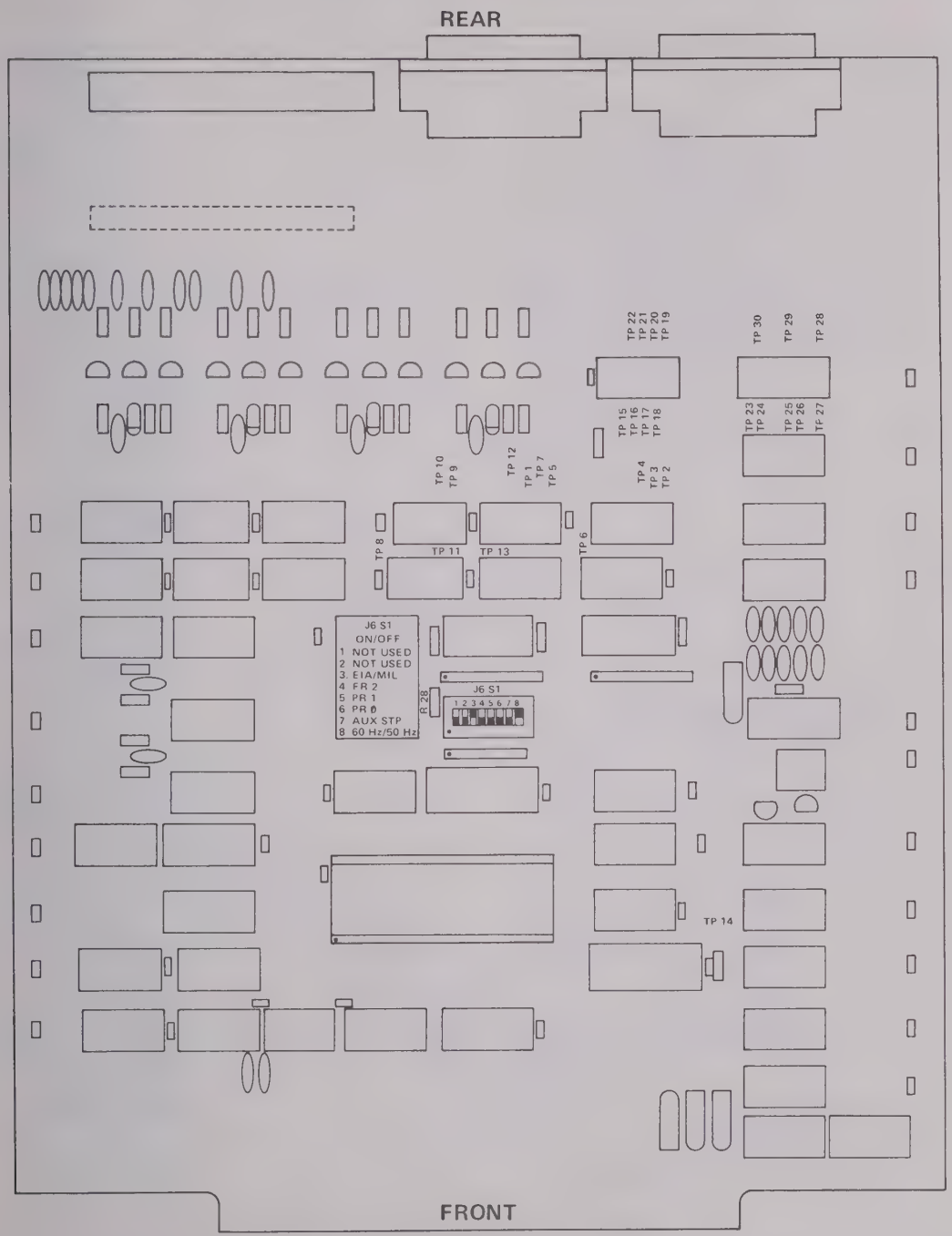

Figure 16-3 Diagram of Line Interface Module

NOTE: Changing the power frequency setting sometimes necessitates adjustment of the CRT vertical hold.

16.4 PREVENTIVE or ROUTINE MAINTENANCE of TAPE DRIVE

The tape head and capstan should be cleaned at least every 8 hours of *tape motion.* Owing to the recording technique, however, the tape is not continuously in motion when recording or playing back. In normal use at low data rates, monthly cleaning should be adequate. On the other hand, if the tape is used 24 hours a day at high data rates, daily cleaning may be necessary. Frequent visual inspection of the tape head is recommended under any operating conditions. The tape head can easily be seen through the cartridge window when the cartridge is removed. If inspection reveals any accumulation of oxide or dirt, the tape head should be cleaned. At the same time, the tachometer disk and tape hole sensors should also be cleaned.

16.4.1 General Cleaning. Any accumulation of dust or dirt may be removed from the interior of the cartridge compartment by careful use of vacuum or low-pressure compressed air. Use care not to damage internal components or blow dirt into the sensitive areas of the tape drive.

16.4.2 Tape Head Cleaning. Although the tape head can be cleaned by reaching through the cartridge window, it is recommended that the top cover and tape drive cover be removed for access to the tape head, capstan, tachometer disk, and tape hole sensor. Refer to Figure 16-4 as you read the following procedure.

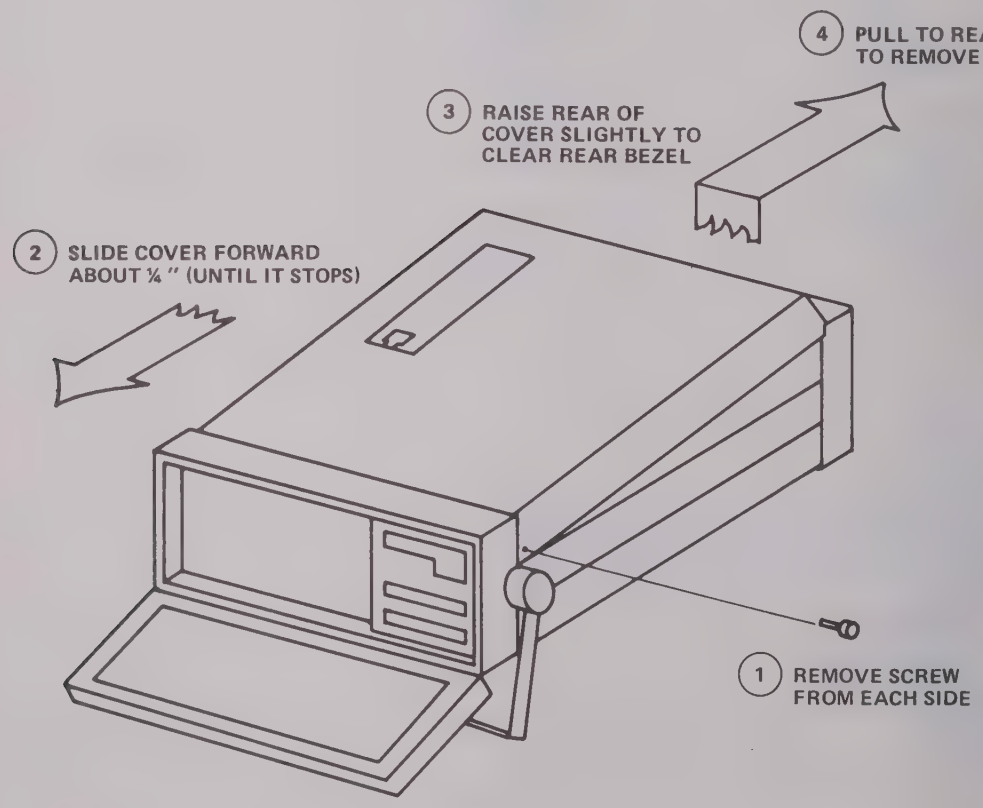
4 PULL TO REAR TO REMOVE
3 RAISE REAR OF COVER SLIGHTLY TO CLEAR REAR BEZEL
2 SLIDE COVER FORWARD ABOUT ¼ " (UNTIL IT STOPS)
1 REMOVE SCREW FROM EACH SIDE

Figure 16-4 Removing the top cover from the INTERVIEW 3500. To remove the bottom cover, follow the same procedure with the unit turned upside down. To replace a cover, reverse the procedure, sliding the cover into the front bezel first.

(1) Disconnect power before removing covers.

WARNING: Removal of the top cover of the INTERVIEW 3500 or 3000 whether or not the cord is connected may expose personnel to dangerous high voltages and high vacuum CRT hazard. Under no circumstances should anyone but qualified service personnel remove the top cover or attempt any kind of repair.

(2) The two screws securing the top cover to the chassis are located adjacent to the handle detent mechanisms on either side of the front of the unit. Remove these two screws.

CAUTION: Raising the cover more than ½ inch during removal or replacement may cause the bezel to deform or crack. The proper procedure requires no force.

(3) Gently slide the top cover toward the *front* of the instrument (about ¼ inch of movement) until it stops.

(4) *Slightly* raise the *rear* of the top cover, just enough so the edges clear the rear bezel, and holding it in this position, slide the cover to the rear (about ½ inch of movement) until it frees itself from the front bezel.

(5) Lift the cover off the instrument. To replace the cover, reverse the procedure, sliding the cover into the front bezel first.

(6) Remove the tape drive cover by carefully lifting it upward to disengage the friction retainers from the holes in the cover. Use care not to break the retainer posts.

(7) Clean the tape head and capstan (the rubber drive wheel under the tachometer disk) (see Figure 16-5) with a cotton swab moistened with isopropyl alcohol or Miller-Stephenson Magnetic Tape Head Cleaner. Other solvents may damage the tape head or capstan.

CAUTION: Do not use rubbing alcohol, acetone, lacquer or paint thinners, or aerosol sprays.

Do not use an excessive amount of solvent and do not allow the solvent to reach the capstan bearings since this will destroy their lubrication.

CAUTION: Under no circumstances should the tape head mounting be moved since this will affect the operation of the recorder.

16.4.3 Tachometer Cleaning. The tachometer disk (see Figure 16-5) should be visually inspected when the tape head is cleaned or at least once a month. If the disk shows any dust, dirt, or fingerprints, it should be cleaned with a soft moist cloth.

16.4.4 Tape Hole Sensor Cleaning. Visual inspection of the tape hole sensor (see Figure 16-5) should be performed when the tape head is cleaned or at least once a month. Remove any accumulation of dirt or dust on the lenses of both the emitter and the sensor by using a soft brush or cotton swab.

16.5 TROUBLESHOOTING: SELF TEST ERROR CODES

CAUTION: There is no need to remove the top cover to check or exchange any of the boards referred to in this section.

All the logic boards considered in this section are accessible through the rear of the unit (as described in Section 16.3). Correct installation of the boards is shown in Figure 16-6.

16.5.1 When an error code and subsequent check indicate that a PC logic board is defective, the best way to confirm the diagnosis is to insert another board of the same revision level, either a spare or one from another INTERVIEW. If this corrects the problem, the defective board can be returned to Atlantic Research Corporation for service.

NOTE: Do not return any unit or components to Atlantic Research without prior authorization.

When the probable cause is a defective or missing ROM, check first that all ROMs on the board are of the correct revision level. Then substitute ROMs of the correct revision level, using spares or borrowing from another unit.

CAUTION: Remove ROMs carefully to avoid bending the pins.

If you identify the defective ROM, you can order the replacement; if necessary, return the board for service.

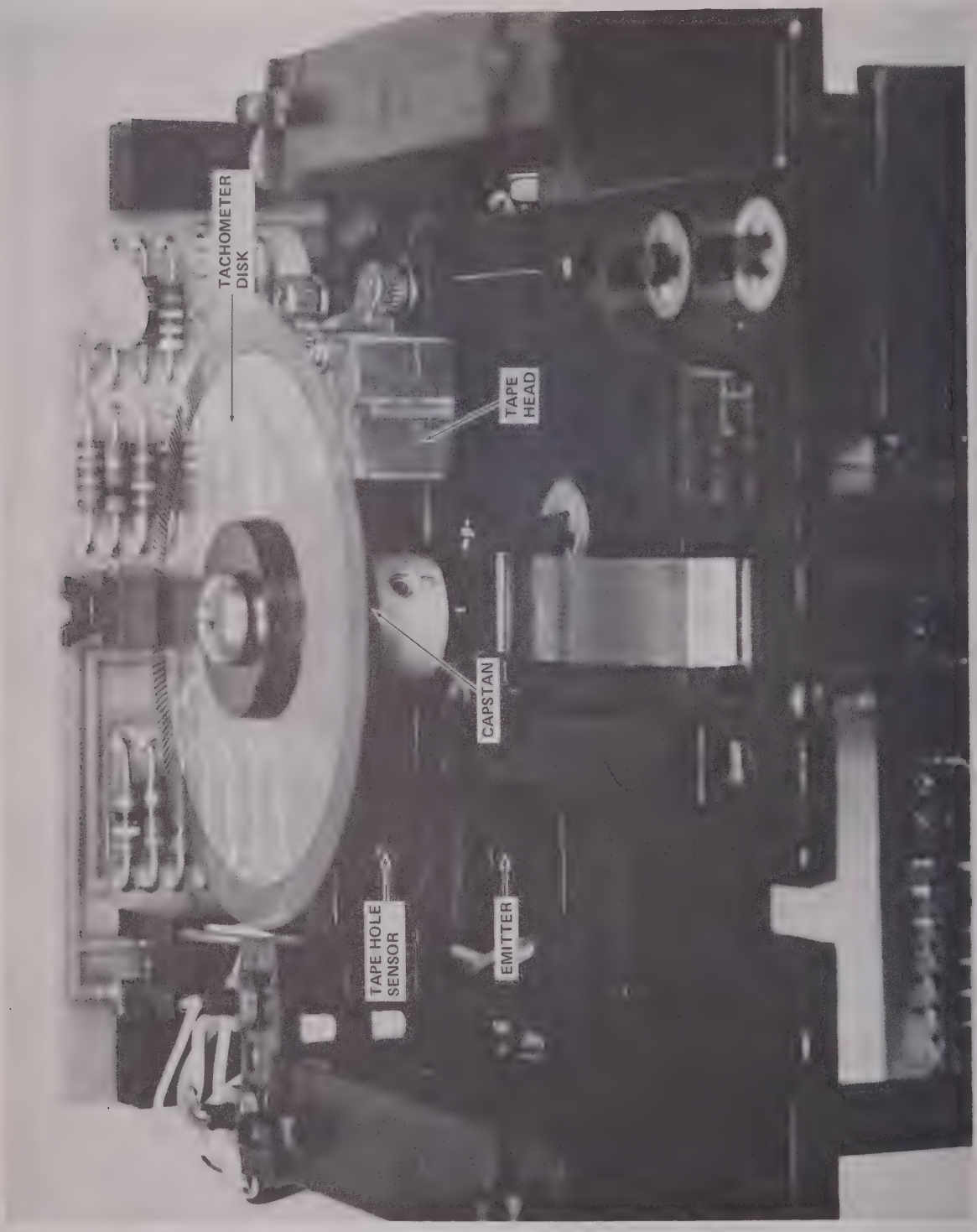

Figure 16-5 Tape Drive, viewed from the top.

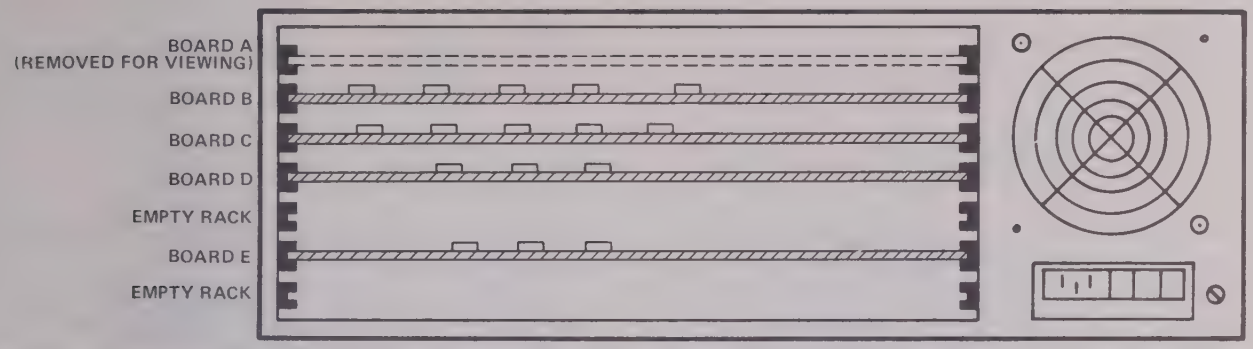

Figure 16-6 PC logic boards for which error codes may indicate defects. Be sure the boards are always installed in the relative positions shown with component side up!

Code	Board	Possible Causes	Action
32	C	Defective RAM	Exchange board; return for service.
34	C	Incorrect ROM installed	Check for correct revision of all ROMs, board C.
		ROM missing	Check all ROMs, board C. Order correct revision level.
		Defective ROM	Exchange ROM; return for service.
40	D	Board not seated in connector or in wrong slot	Check that all boards are in correct slot and properly seated.
		Board defective	Exchange board; return for service.
42	D	Defective RAM	Exchange board; return for service.
44	D	Incorrect ROM installed	Check for correct revision of all ROMs, board D.
		ROM missing	Check all ROMs, board D. Order correct revision level.
		Defective ROM	Exchange ROM; return for service.
48	D	Incorrect software	Check for correct revision of all ROMs, boards C and D.
		Board defective	Exchange; return for service.

16.5.2 Series 60 errors only apply to the INTERVIEW 3500. If a 60-series error appears on an INTERVIEW 3000, check to see that S1-4 on the Line Interface Module (Board A; see Section 16.3) is in the ON position. If the error persists exchange the Line Interface Module. If this corrects the error, return the Line Interface Module for service.

Code	Board	Possible Causes	Action
60	F	Board not seated in connector or in wrong slot	Check that all boards are in correct slot and properly seated.
		Board defective	Exchange board; return for service.
62	F	Defective RAM	Exchange board; return for service.
64	F	Incorrect ROM installed	Check for correct revision of all ROMs, Board F.
		ROM missing	Check all ROMs, Board F. Order correct revision level.
		Defective ROM	Exchange ROM; return for service.

Code	Board	Possible Causes	Action
68	F	Incorrect software	Check for correct revision of all ROMs on Boards C and F.
		Board defective	Exchange board; return for service.

16.5.3 Board B is the CRT Driver Board. If the CRT display does not come up, connect a video monitor to the video output on the rear of the unit. If you obtain a display on the auxiliary monitor, the fault is probably in the CRT or its immediate area; if no display appears, replace Board B with another of the correct revision level. If this solves the problem, return the defective board for service.

16.6 CRT ADJUSTMENTS

CRT adjustments should only be performed if there is good reason to believe they are required. In order to make the adjustments, the INTERVIEW must be operated with the top cover removed and the adjustments must be performed in an area that exposes service personnel to dangerous high voltages and the hazards of the high-vacuum CRT. Also, while the covers are removed there is great danger of overheating with the possibility of permanent damage. *Thus, the following procedures should be performed only by thoroughly qualified personnel in strict accordance with these instructions.*

16.6.1 Equipment Required: (1) one screwdriver; (2) 1 clip lead.

WARNING: Removal of the top cover of the INTERVIEW 3500 or 3000 with or without the power cord connected may expose personnel to dangerous high voltages and high vacuum CRT hazard. Under no circumstances should anyone but qualified service personnel remove the top cover or attempt any kind of repair.

16.6.2 Remove the top cover in accordance with steps (1) through (5) of Section 16.4.2 (see also Figure 16-4).

CAUTION: Operation of the INTERVIEW with the top cover removed exposes the unit to the possibility of damage due to overheating. Keep operating time to a minimum while the cover is off.

16.6.3 Background Brightness Adjustment.

(1) Power up the INTERVIEW.

(2) Using the brightness control on the rear panel (see Figure 16-1), adjust the CRT brightness to a minimum so that no data is visible.

(3) With a screwdriver, adjust R116 on the CRT Electronics Board (see Figures 16-7 and 16-8) clockwise until you see the CRT raster pattern.

(4) Back down the adjustment (counterclockwise) until the raster just disappears. Then readjust the rear panel brightness control as explained in Section 16.2.2.

16.6.4 Vertical Hold. After the frequency setting on the Line Interface Module (see Section 16.3) has been changed from 60 to 50 Hz or vice versa, the CRT display may roll.

(1) Set the switch S1-8 on the Line Interface Module to the OFF position (50 Hz) (see Section 16.3).

(2) With a clip lead, connect the bottom end of R106 on the CRT Electronics Board (Figure 16-8) to ground.

(3) Operate the red PROGRAM key.

(4) With a screwdriver, turn the Vertical Hold adjustment on the upper, rear corner of the CRT Electronics Board (see Figure 16-8) until the display *rolls UP very slowly.*

(5) Disconnect R106 from ground. The display should lock and stand still.

16.6.5 Other Adjustments. A qualified electronics technician may make other standard adjustments to the CRT, such as display rotation, centering, height, width, or linearity. If the need arises, contact Atlantic Research Corporation for further information.

16.7 CALIBRATION OF TAPE DRIVE

Calibrations should only be performed if there is good reason to believe that they are required. In order to make the adjustments the INTERVIEW must be operated with top and bottom covers removed. This exposes the service personnel to dangerous high voltages and the hazards of the high vacuum CRT. Also, while the covers are removed, there is great danger of overheating with the possibility of permanent damage. Thus, *the following procedures should be performed only by thoroughly qualified personnel in strict accordance with these instructions.*

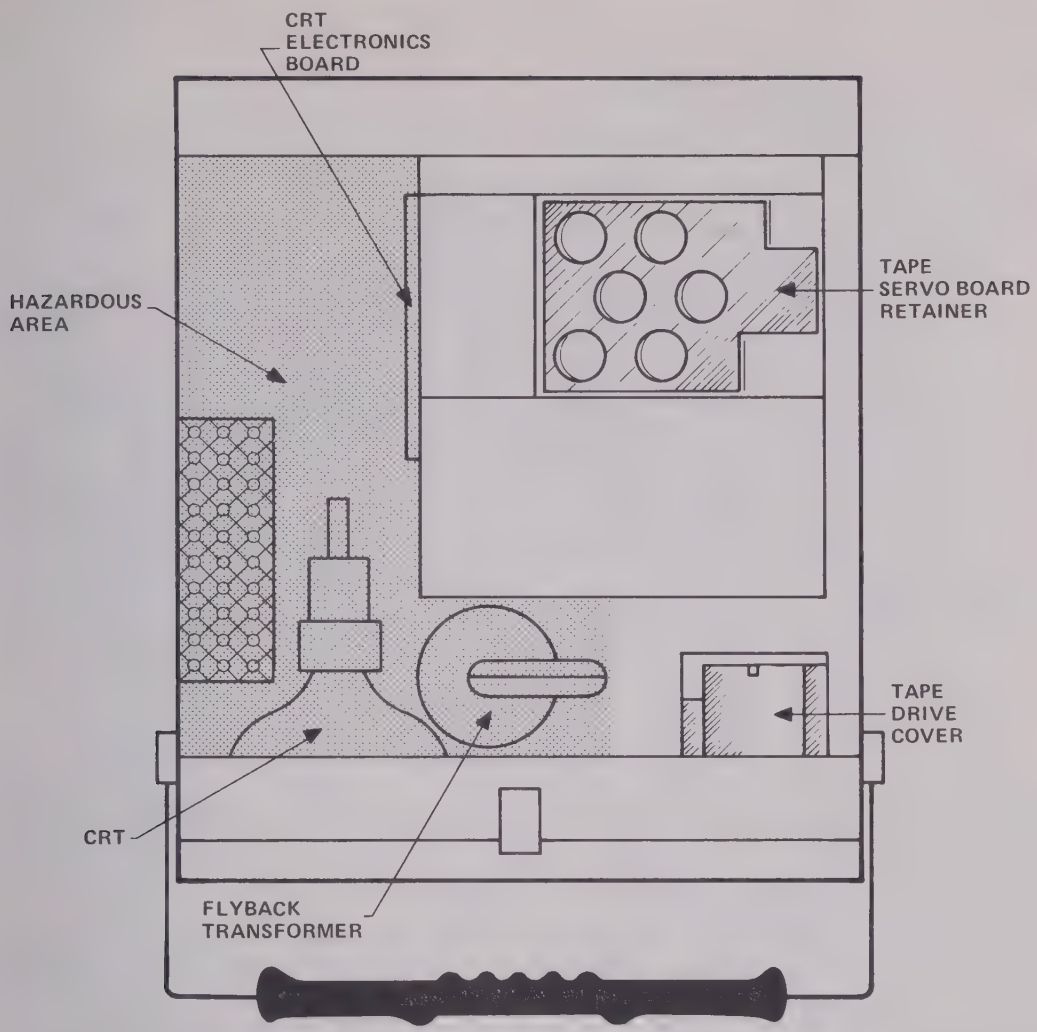

Figure 16-7 Top view of INTERVIEW 3500 with top cover removed. Tape Servo Board is under the Tape Servo Board Retainer.

16.7.1 Equipment Required: (1) frequency counter; (2) oscilloscope; (3) new blank tape cartridge; (4) tape cartridge with recorded data (training tape).

WARNING: Removal of the top or bottom cover of the INTERVIEW 3500 or 3000 with or without the power cord connected may expose personnel to dangerous high voltages and high vacuum CRT hazard. Under no circumstances should anyone but qualified service personnel remove the top or bottom cover or attempt any kind of repair.

16.7.2 Remove the top cover in accordance with steps (1) through (5) of Section 16.4.2 (Figure 16-4).

16.7.3 To remove the bottom cover, turn the unit upside down and follow the same procedure as for the top cover.

CAUTION: Operation of the INTERVIEW with top and (or) bottom covers removed exposes the unit to the possibility of damage due to overheating. Keep operating time to a minimum while the covers are off.

16.7.4 Tape Speed Adjustment.

(1) Remove the top cover and the Tape Servo Board Retainer (see Figure 16-7).

(2) Insert a new blank tape in the drive.

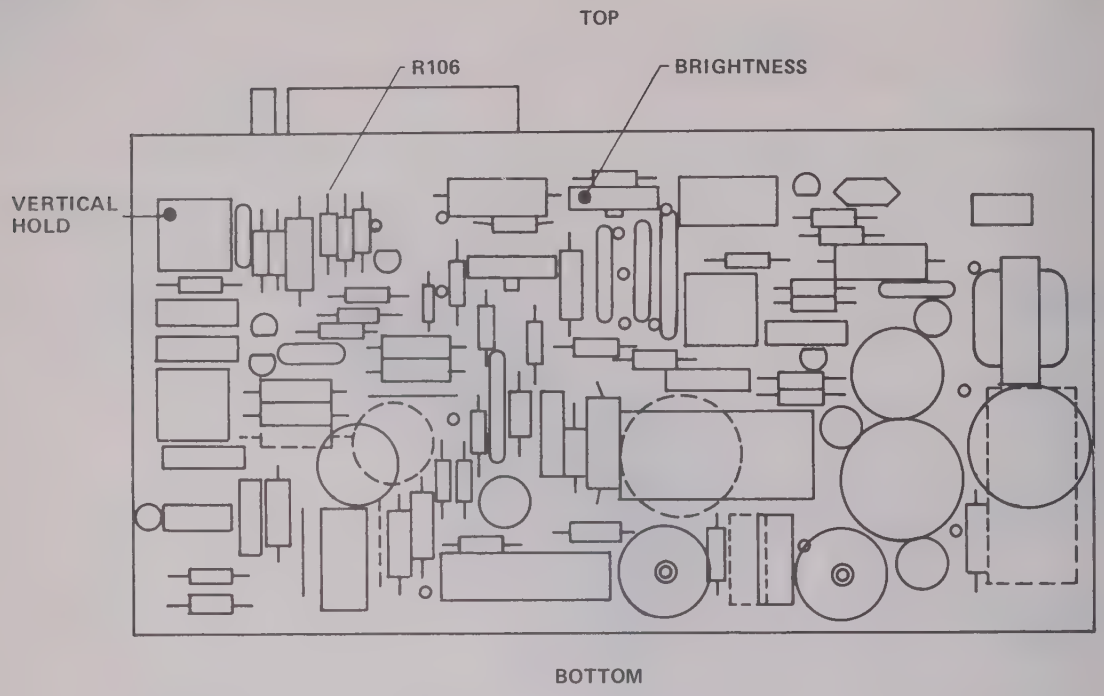

Figure 16-8 Diagram of CRT Electronics Board. For location of this board in unit, see Figure 16-7.

(3) Connect the frequency counter common ground to the chassis.

(4) Connect the frequency counter input to TP 5 on the Tape Servo Board (Figures 16-7 and 16-9).

(5) Power up the INTERVIEW. Press PROGRAM; then PARAMETERS and numeral 1. On the Parameters 1 menu now displayed, use the cursor keys to select TAPE on the SOURCE line.

(6) Operate the MONITOR key. The tape should rewind and then run continuously forward. If the tape starts and stops, data has been recorded on the tape and it cannot be used for this purpose. *A new tape must be used to set tape speed.*

(7) The frequency counter should indicate 7900 ± 150 Hz. This measurement must be made while the tape is moving continuously forward. If the tape reaches the end and reverses before the reading is obtained, operate the PROGRAM key and then the MONITOR key to rewind and restart the tape.

(8) If necessary, use a screwdriver to adjust R29 on the Tape Servo Board (Figure 16-9) to obtain a reading of 7900 ± 150 Hz. The frequency will vary somewhat over the length of the tape, but should remain within the ± 150 Hz tolerance. The tape speed is set at the factory to be as close as possible to 7900 Hz at the beginning of the tape after the counter reading has stabilized.

(9) After adjustment, press PROGRAM and MONITOR again to rewind the tape and recheck the reading over the length of the tape.

(10) Press PROGRAM and then power down the unit immediately.

16.7.5 Read Gain Adjustment.

(1) Remove top and bottom covers (Figure 16-4) and Tape Servo Board Retainer (Figure 16-7).

(2) Clean the tape head before performing this adjustment (refer to Section 16.4.2).

(3) Insert a recorded tape (training tape) in the drive.

(4) Connect the oscilloscope common ground to the chassis. Connect the oscilloscope input to Pin 6 of U15 on the Tape Servo Board (see Figure 16-9).

(5) Power-up the 3500. Press PROGRAM; then PARAMETERS and (numeral) 1.

(6) Using the cursor, select TAPE on the SOURCE line; then use the ENTER key to get to the SPEED line and enter (numerals) 9600. Operate the MONITOR key.

(7) *While data is being read from the tape,* the waveform at Pin 6 of U15 should be $8 \pm \frac{0}{1}$ V peak-to-peak.

(8) If necessary, use a screwdriver to adjust R3 on the Read-Write Board (see Figures 16-10 and 16-11) to obtain the correct waveform. The Read-Write Board is located on the bottom of the tape drive and is accessible through the chassis from the bottom of the INTERVIEW.

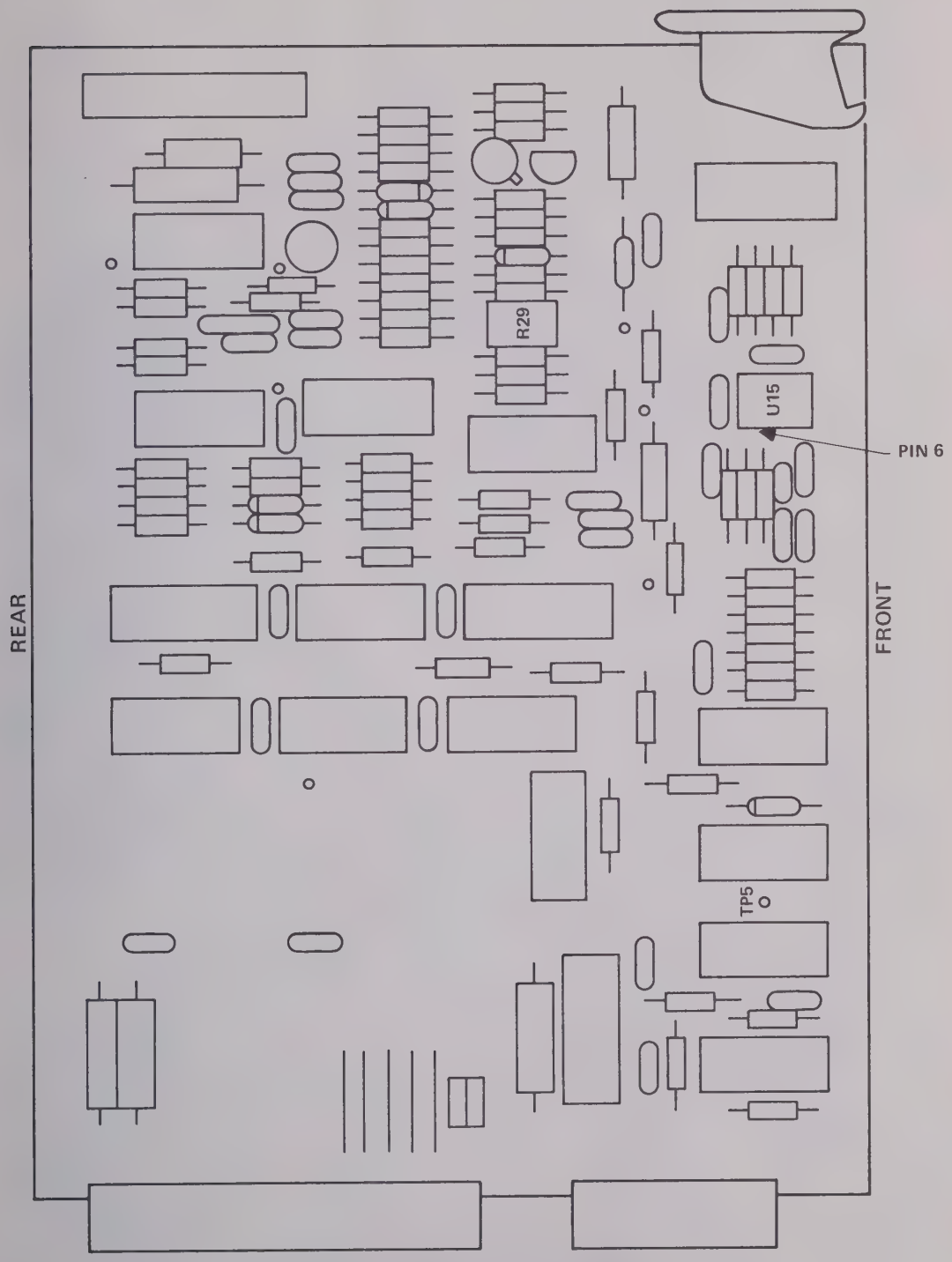

Figure 16-9 Diagram of Tape Servo Board

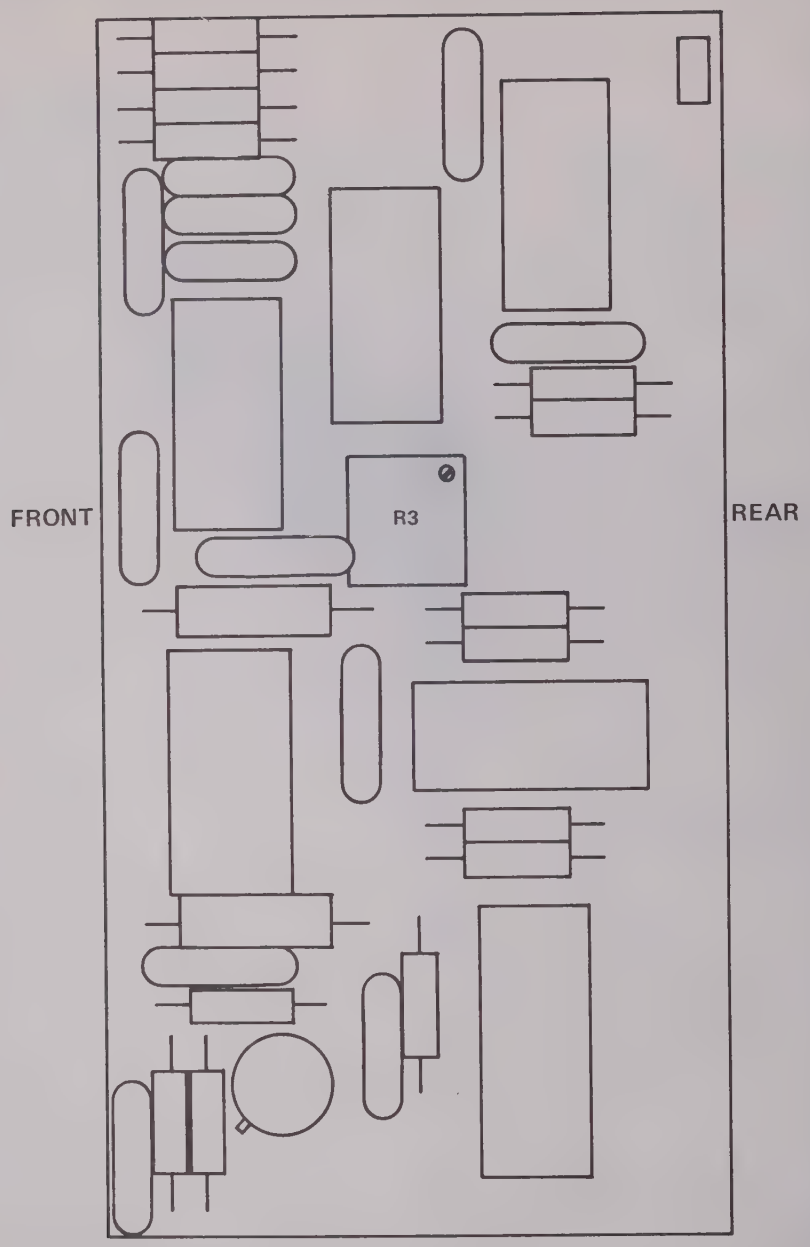

Figure 16-10 Diagram of Read-Write Board viewed through the chassis from underside of unit. (See also Figure 16-11.)

(9) Press PROGRAM and then power down the INTERVIEW immediately.

16.7.6 Tape Hole Sensor Adjustment.

(1) Power up the INTERVIEW.

(2) Install any tape in the drive.

(3) Operate PROGRAM, then the LOAD PROG key to position the tape.

(4) Power down the INTERVIEW.

(5) Remove the tape. Looking at the cartridge from the rear, lift the tape head door and observe the single load point hole in the tape. Locate the load point hole by pushing the roller toward the door and position the hole directly over the mirror.

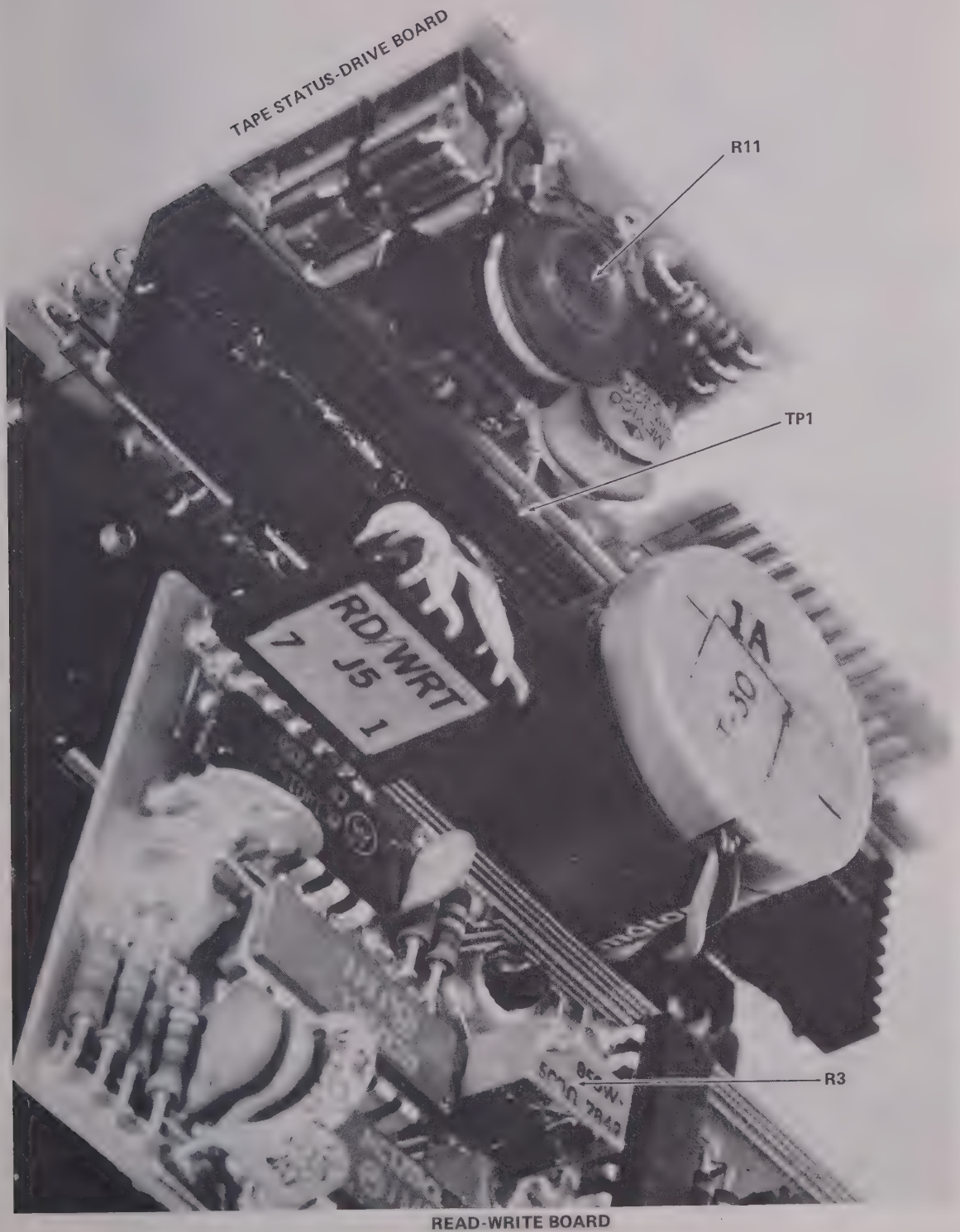

Figure 16-11 Tape Status-Drive Board seen through chassis from front and side of unit; cf. Figure 16-12.

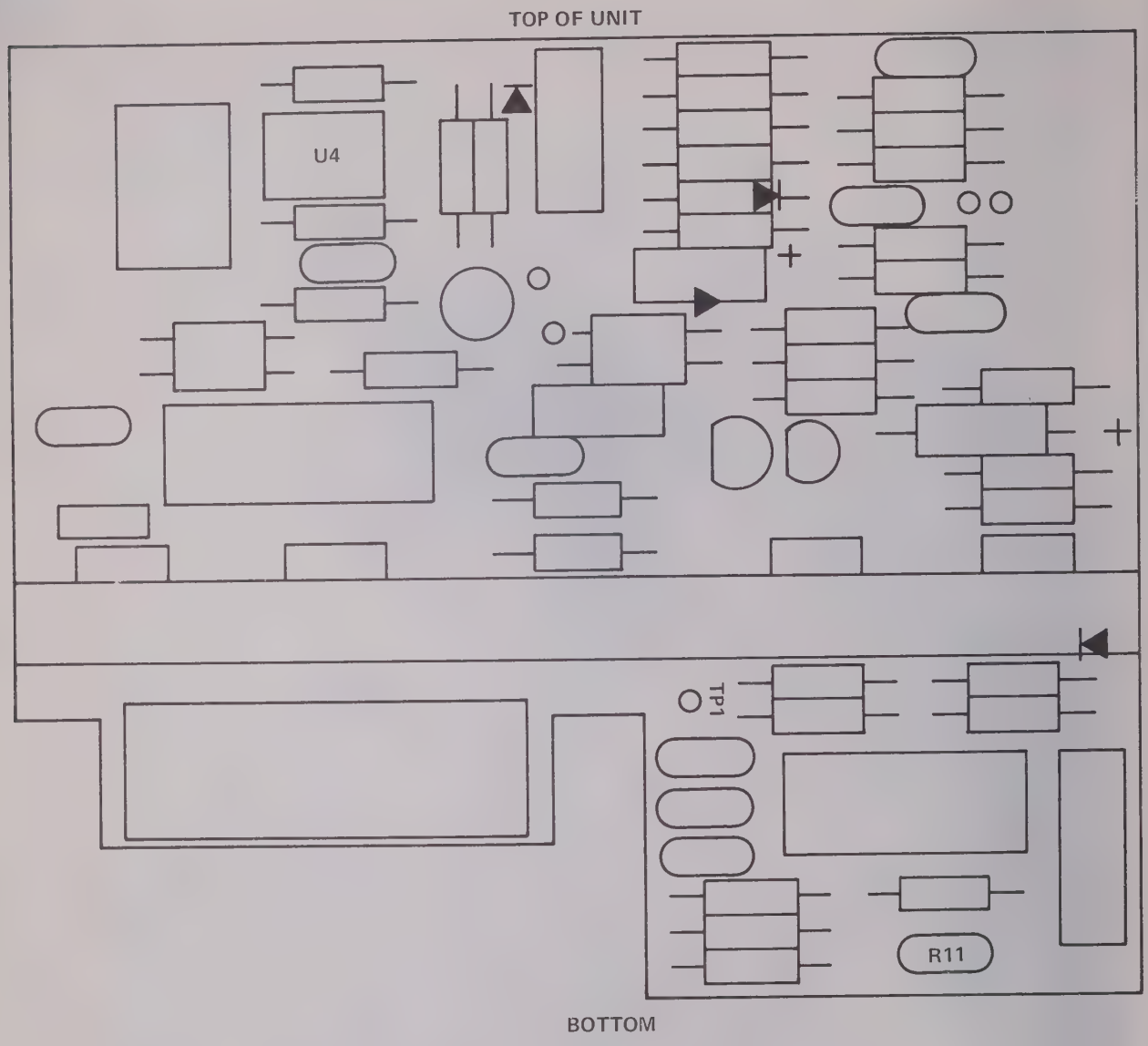

Figure 16-12a

(6) Do *not* install the tape now.

(7) Remove the top and bottom covers of the unit (refer to Figure 16-2).

(8) Clean the tape hole sensor before performing this adjustment (refer to Section 16.4.4).

(9) Determine which of two possible tape status drive boards has been installed in your unit. The Tape Status-Drive Board is located on the rear of the tape drive. Compare the top of the board, behind the tachometer disk, with Figures 16-12a and 16-12b. If your board has 555 timer U4, you will refer to Figure 16-12a and the procedure of paragraph (12a). If the board has unijunction transistor Q1, you will refer to Figure 16-12b and the procedure in paragraph (12b). Now go to paragraph (10).

(10) Connect the oscilloscope common ground to the chassis. Connect the oscilloscope input to TP 1 on the Tape Status-Drive Board. TP 1 is accessible through cutouts in the bottom and side of the INTERVIEW chassis (see Figures 16-11 and 16-12a or b).

(11) Power up the unit. After the internal self tests are finished, reinstall the tape in the drive. Monitor TP 1 on the oscilloscope while you rotate the tape capstan-tachometer disk back and forth by hand until you obtain a waveform; continue until a maximum peak-to-peak waveform is obtained.

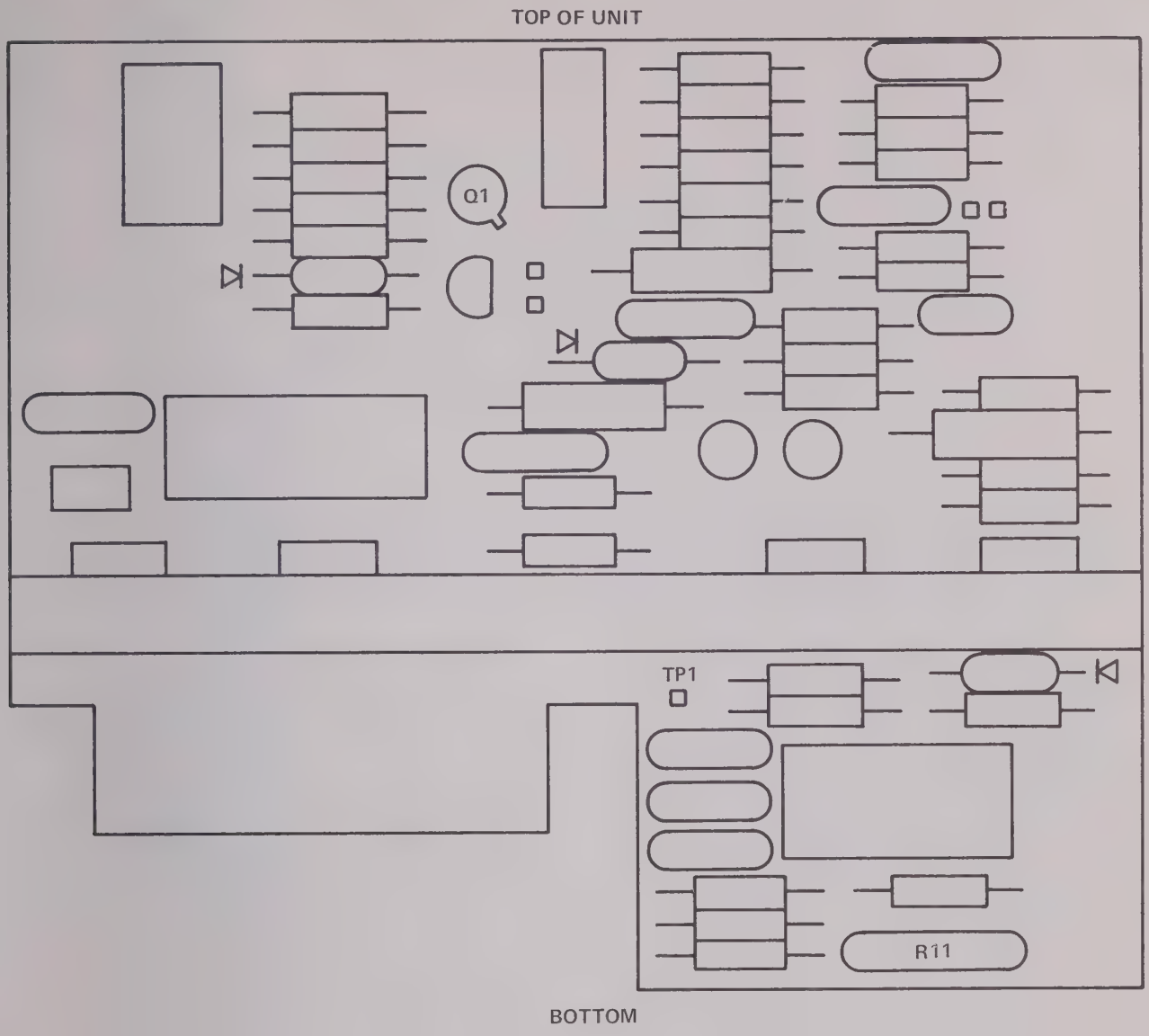

Figure 16-12b

(12a) If the board in your unit has U4 (Figure 16-12a), adjust R11 (Figures 16-11 and 16-12a) for a minimum output of 1.3 V peak to peak. Then continue the adjustment to maximize the peak-to-peak voltage while keeping the dc offset voltage at less than 6 V.

(12b) If the board in your unit has Q1 (Figure 16-12b), adjust R11 (Figures 16-11 and 16-12b) for 1.2 V peak to peak. The maximum allowable voltage is 1.3 V peak to peak and the dc offset voltage must be less than 5 V.

(13) Power down the unit.

(14) Remove the tape. Move the tape by hand until the hole is no longer over the mirror. If the hole is left over the mirror, the INTERVIEW will not detect the presence of the tape.

16.7.7 Cover Replacement. Be sure to replace the Tape Servo Board Retainer and Tape Drive Cover before you replace the top cover of the unit.

To replace top and bottom covers, see Section 16.3.2, steps (1) through (5), and Figure 16-2.

17 Packing and Shipping

The INTERVIEW 3000 or 3500 is usually shipped either as baggage or as freight. The basic difference, of course, is in the quantity and quality of handling to which the unit is subjected. It follows that different packing methods are called for.

When a unit is shipped as baggage, it will probably be subjected to much less severe treatment than by freight. Atlantic Research Corporation offers its INTERVIEW Option Padded Travel Bag, stock 37408, for this purpose. This bag provides two inches of high-density foam protection to all surfaces of the INTERVIEW. It is yellow for easy identification among other luggage. An identification card case, *FRAGILE* markings, and leather appointments are standard features. Inside is a large pocket for carrying notes, manuals, and so forth. The bag is considered to be reasonable protection for the INTERVIEW when shipped as baggage. However, Atlantic Research Corporation can assume no liability for damage to units shipped this way, owing to circumstances beyond our control.

For freight shipment, the INTERVIEW 3000 or 3500 should be packed only in High Density Styrofoam "Clamshell," and a heavy-duty outer cardboard carton, as received from Atlantic Research. This packing system has been specifically designed to provide maximum reasonable protection to the INTERVIEW, and insure its safe arrival. However, damages due to mishandling must be the responsibility of the Carrier.

NOTE: Please do not return any unit to Atlantic Research Corporation without prior authorization.

APPENDIX A
Keyboard Translation Tables for 3000-Series INTERVIEW

EBCDIC

KEY	UNSHIFTED		SHIFTED		CONTROL	
A	a	81	A	C1	SOH	01
B	b	82	B	C2	STX	02
C	c	83	C	C3	ETX	03
D	d	84	D	C4	EOT	37
E	e	85	E	C5	ENQ	2D
F	f	86	F	C6	ACK	2E
G	g	87	G	C7	BELL	2F
H	h	88	H	C8	BS	16
I	i	89	I	C9	HT	05
J	j	91	J	D1	LF	25
K	k	92	K	D2	VT	0B
L	l	93	L	D3	FF	0C
M	m	94	M	D4	GS	1D
N	n	95	N	D5	SO	0E
O	o	96	O	D6	SI	0F
P	p	97	P	D7	DLE	10
Q	q	98	Q	D8	DC1	11
R	r	99	R	D9	DC2	12
S	s	A2	S	E2	DC3	13
T	t	A3	T	E3	DC4	3C
U	u	A4	U	E4	NAK	3D
V	v	A5	V	E5	SYN	32
W	w	A6	W	E6	ETB	26
X	x	A7	X	E7	CAN	18
Y	y	A8	Y	E8	EM	19
Z	z	A9	Z	E9	SUB	3F
0	0	F0	¦	6A	—	—
1	1	F1	!	5A	—	—
2	2	F2	″	7F	—	—
3	3	F3	#	7B	—	—
4	4	F4	$	5B	—	—
5	5	F5	%	6C	—	—
6	6	F6	&	50	—	—
7	7	F7	′	7D	—	—
8	8	F8	(	4D	—	—
9	9	F9	)	5D	—	—
SPACE	SPACE	40	SPACE	40	—	—
:	:	7A	*	5C	ESC	27
;	;	5E	+	4E	NULL	00
,	,	6B	<	4C	RS	35
– DASH	-	60	=	7E	—	—
.	.	4B	>	6E	—	—
/	/	61	?	6F	FS	22
[	—	—	{	C0	—	—
\	\	E0	@	7C	—	—
]	—	—	}	D0	—	—
∧	—	—	~	A1	—	—
UNDERLINE	_	6D	`	79	DEL	07
NL	LF	25	LF	25		
CR	CR	0D	CR	0D	CR	0D

ASCII and HEX (Space Parity shown)

KEY	UNSHIFTED		SHIFTED		CONTROL	
A	a	61	A	41	SOH	01
B	b	62	B	42	STX	02
C	c	63	C	43	ETX	03
D	d	64	D	44	EOT	04
E	e	65	E	45	ENQ	05
F	f	66	F	46	ACK	06
G	g	67	G	47	BELL	07
H	h	68	H	48	BS	08
I	i	69	I	49	HT	09
J	j	6A	J	4A	LF	0A
K	k	6B	K	4B	VT	0B
L	l	6C	L	4C	FF	0C
M	m	6D	M	4D	GS	1D
N	n	6E	N	4E	SO	0E
O	o	6F	O	4F	SI	0F
P	p	70	P	50	DLE	10
Q	q	71	Q	51	DC1	11
R	r	72	R	52	DC2	12
S	s	73	S	53	DC3	13
T	t	74	T	54	DC4	14
U	u	75	U	55	NAK	15
V	v	76	V	56	SYN	16
W	w	77	W	57	ETB	17
X	x	78	X	58	CAN	18
Y	y	79	Y	59	EM	19
Z	z	7A	Z	5A	SUB	1A
0	0	30	¦	7C	—	—
1	1	31	!	21	—	—
2	2	32	″	22	—	—
3	3	33	#	23	—	—
4	4	34	$	24	—	—
5	5	35	%	25	—	—
6	6	36	&	26	—	—
7	7	37	′	27	—	—
8	8	38	(	28	—	—
9	9	39	)	29	—	—
SPACE	SPACE	20	SPACE	20	—	—
:	:	3A	*	2A	ESC	1B
;	;	3B	+	2B	NULL	00
,	,	2C	<	3C	RS	1E
– DASH	-	2D	=	3D	—	—
.	.	2E	>	3E	VS	1F
/	/	2F	?	3F	FS	1C
[	[	5B	{	7B	—	—
\	\	5C	@	40	—	—
]	]	5D	}	7D	—	—
∧	∧	5E	~	7E	—	—
UNDERLINE	_	5F	`	60	DEL	7F
NL	LF	0A	LF	0A	FLAG	7E
CR	CR	0D	CR	0D	CR	0D

EBCD (Odd Parity shown)

KEY	UNSHIFTED		SHIFTED		CONTROL	
A	a	23	A	23	SOH	—
B	b	13	B	13	STX	—
C	c	73	C	73	ETX	—
D	d	0B	D	0B	EOT	7C
E	e	6B	E	6B	ENQ	—
F	f	5B	F	5B	ACK	—
G	g	3B	G	3B	BELL	—
H	h	07	H	07	BS	5D
I	i	67	I	67	HT	2F
J	j	61	J	61	LF	6E
K	k	51	K	51	VT	—
L	l	31	L	31	FF	—
M	m	49	M	49	GS	—
N	n	29	N	29	SO	—
O	o	19	O	19	SI	—
P	p	79	P	79	DLE	—
Q	q	45	Q	45	DC1	—
R	r	25	R	25	DC2	—
S	s	52	S	52	DC3	—
T	t	32	T	32	DC4	—
U	u	4A	U	4A	NAK	—
V	v	2A	V	2A	SYN	—
W	w	1A	W	1A	ETB	—
X	x	7A	X	7A	CAN	—
Y	y	46	Y	46	EM	—
Z	z	26	Z	26	SUB	—
0	0	54	¦	—	—	—
1	1	20	!	75	—	—
2	2	10	"	34	—	—
3	3	70	#	34	—	—
4	4	08	$	75	—	—
5	5	68	%	68	—	—
6	6	58	&	43	—	—
7	7	38	'	58	—	—
8	8	04	(	64	—	—
9	9	64	)	54	—	—
SPACE	SPACE	40	SPACE	40	—	—
:	:	08	*	04	ESC	—
;	;	6B	+	43	NULL	—
,	,	76	<	10	RS	2C
DASH	-	37	=	13	—	—
.	.	37	>	38	US	—
/	/	62	?	07	FS	—
[	[	20	{	—	—	—
\	\	—	@	10	—	—
]	]	20	}	—	—	—
^	^	—	~	—	—	—
UNDERLINE	_	—	—	—	DEL	7F
NL	NL	6D	LF	6E	FLAG	7E
CR	CR	6D	CR	6D	CR	6D

XS-3 (SY = 35; EOM = 55)

KEY	UNSHIFTED		SHIFTED		CONTROL	
A	a	14	A	14	SOH	—
B	b	15	B	15	STX	—
C	c	16	C	16	ETX	—
D	d	17	D	17	EOT	—
E	e	18	E	18	ENQ	—
F	f	19	F	19	ACK	—
G	g	1A	G	1A	BELL	—
H	h	1B	H	1B	BS	—
I	i	1C	I	1C	HT	—
J	j	24	J	24	LF	—
K	k	25	K	25	VT	—
L	l	26	L	26	FF	—
M	m	27	M	27	GS	—
N	n	28	N	28	SO	—
O	o	29	O	29	SI	—
P	p	2A	P	2A	DLE	—
Q	q	2B	Q	2B	DC1	—
R	r	2C	R	2C	DC2	—
S	s	35	S	35	DC3	—
T	t	36	T	36	DC4	—
U	u	37	U	37	NAK	—
V	v	38	V	38	SYN	—
W	w	39	W	39	ETB	—
X	x	3A	X	3A	CAN	—
Y	y	3B	Y	3B	EM	—
Z	z	3C	Z	3C	SUB	—
0	0	03	¦	—	—	—
1	1	04	!	23	—	—
2	2	05	"	—	—	—
3	3	06	#	1F	—	—
4	4	07	$	22	—	—
5	5	08	%	2D	—	—
6	6	09	&	33	—	—
7	7	0A	'	2E	—	—
8	8	0B	(	31	—	—
9	9	0C	)	3D	—	—
SPACE	SPACE	00	SPACE	00	—	—
:	:	11	*	21	ESC	—
;	;	0E	+	10	NULL	—
,	,	32	<	1E	RS	—
DASH	-	02	=	1D	—	—
.	.	12	>	3E	US	—
/	/	34	?	13	FS	—
[	[	0F	{	—	—	—
\	\	0D	@	20	—	—
]	]	01	}	—	—	—
^	^	2F	~	—	—	—
UNDERLINE	_	—	`	—	DEL	—
NL	NL	—	LF	—	FLAG	—
CR	CR	—	CR	—	CR	—

IPARS

KEY	UNSHIFTED		SHIFTED		CONTROL	
A	a	31	A	31	SOH	—
B	b	32	B	32	STX	—
C	c	33	C	33	ETX	1D
D	d	34	D	34	EOT	—
E	e	35	E	35	ENQ	—
F	f	36	F	36	ACK	—
G	g	37	G	37	BELL	0F
H	h	38	H	38	BS	—
I	i	39	I	39	HT	0D
J	j	21	J	21	LF	—
K	k	22	K	22	VT	—
L	l	23	L	23	FF	—
M	m	24	M	24	GS	—
N	n	25	N	25	SO	—
O	o	26	O	26	SI	—
P	p	27	P	27	DLE	3D
Q	q	28	Q	28	DC1	—
R	r	29	R	29	DC2	—
S	s	12	S	12	DC3	1E
T	t	13	T	13	DC4	—
U	u	14	U	14	NAK	2D
V	v	15	V	15	SYN	3E
W	w	16	W	16	ETB	—
X	x	17	X	17	CAN	—
Y	y	18	Y	18	EM	—
Z	z	19	Z	19	SUB	—
0	0	0A	|	—	—	—
1	1	01	!	—	—	—
2	2	02	"	—	—	—
3	3	03	#	1B	—	—
4	4	04	$	30	—	—
5	5	05	%	3C	—	—
6	6	06	&	—	—	—
7	7	07	'	—	—	—
8	8	08	(	2F	—	—
9	9	09	)	2E	—	—
SPACE	SPACE	1C	SPACE	1C	—	—
:	:	2A	*	0B	ESC	—
;	;	1F	+	—	NULL	00
,	,	1A	<	—	RS	—
DASH	-	3B	=	—	—	—
.	.	—	>	—	US	—
/	/	—	?	3A	FS	—
[	[	—	{	—	—	—
\	\	—	@	20	—	—
]	]	—	}	—	—	—
^	^	—	~	—	—	—
UNDERLINE	_	—	—	—	DEL	—
NL	NL	—	LF	—	FLAG	7E
CR	CR	0C	CR	0C	CR	0C

REVERSE EBCD (Odd Parity shown)

KEY	UNSHIFTED		SHIFTED		CONTROL	
A	a	31	A	31	SOH	—
B	b	32	B	32	STX	—
C	c	73	C	73	ETX	—
D	d	34	D	34	EOT	5E
E	e	75	E	75	ENQ	—
F	f	76	F	76	ACK	—
G	g	37	G	37	BELL	—
H	h	38	H	38	BS	6E
I	i	79	I	79	HT	3D
J	j	61	J	61	LF	5D
K	k	62	K	62	VT	—
L	l	23	L	23	FF	—
M	m	64	M	64	GS	—
N	n	25	N	25	SO	—
O	o	26	O	26	SI	—
P	p	67	P	67	DLE	—
Q	q	68	Q	68	DC1	—
R	r	29	R	29	DC2	—
S	s	52	S	52	DC3	—
T	t	13	T	13	DC4	—
U	u	54	U	54	NAK	—
V	v	15	V	15	SYN	—
W	w	16	W	16	ETB	—
X	x	57	X	57	CAN	—
Y	y	58	Y	58	EM	—
Z	z	19	Z	19	SUB	—
0	0	4A	¦	—	—	—
1	1	01	!	6B	—	—
2	2	02	"	0B	—	—
3	3	43	#	0B	—	—
4	4	04	$	6B	—	—
5	5	45	%	45	—	—
6	6	46	&	70	—	—
7	7	07	'	46	—	—
8	8	08	(	49	—	—
9	9	49	)	0A	—	—
SPACE	SPACE	40	SPACE	40	SPACE	40
:	:	04	*	08	ESC	—
;	;	03	+	70	NULL	—
,	,	5B	<	02	RS	0D
DASH	-	20	=	01	—	—
.	.	3B	>	07	US	—
/	/	51	?	51	FS	—
[	[	4C	{	—	—	—
\	\	2C	@	10	—	—
]	]	4C	}	—	—	—
^	^	2C	~	—	—	—
UNDERLINE	_	—	—	—	DEL	7F
NL	NL	5D	LF	5D	FLAG	7E
CR	CR	6D	CR	6D	CR	6D

BAUDOT

KEY	UNSHIFTED		SHIFTED		CONTROL	
A	a	03	A	03	SOH	—
B	b	19	B	19	STX	—
C	c	0E	C	0E	ETX	—
D	d	09	D	09	EOT	—
E	e	01	E	01	ENQ	—
F	f	0D	F	0D	ACK	—
G	g	1A	G	1A	BELL	—
H	h	14	H	14	BS	—
I	i	06	I	06	HT	—
J	j	0B	J	0B	LF	02
K	k	0F	K	0F	VT	—
L	l	12	L	12	FF	—
M	m	1C	M	1C	GS	—
N	n	0C	N	0C	SO	—
O	o	18	O	18	SI	—
P	p	16	P	16	DLE	—
Q	q	17	Q	17	DC1	—
R	r	0A	R	0A	DC2	—
S	s	05	S	05	DC3	—
T	t	10	T	10	DC4	—
U	u	07	U	07	NAK	—
V	v	1E	V	1E	SYN	—
W	w	13	W	13	ETB	—
X	x	1D	X	1D	CAN	—
Y	y	15	Y	15	EM	—
Z	z	11	Z	11	SUB	—
0	0	16	¦	—	—	—
1	1	17	!	0D	—	—
2	2	13	″	11	—	—
3	3	01	#	14	—	—
4	4	0A	$	09	—	—
5	5	10	%	—	—	—
6	6	15	&	—	—	—
7	7	07	′	0B	—	—
8	8	1A	(	0F	—	—
9	9	18	)	12	—	—
SPACE	SPACE	04	SPACE	04	—	—
:	:	0E	*	—	ESC	—
;	;	1E	+	—	NULL	—
,	,	0C	<	—	RS	—
_ DASH	-	03	=	—	—	—
.	.	1C	>	—	US	—
/	/	1D	?	19	FS	—
[	[	—	{	—	—	—
\	\	—	@	—	—	—
]	]	—	}	—	—	—
^	^	—	~	—	—	—
UNDERLINE	_	—	—	—	DEL	—
NL	NL	02	LF	02	FLAG	7E
CR	CR	08	CR	08	CR	08

APPENDIX B
Input-to-Display Translation Tables for 3000-Series INTERVIEW

INPUT HEX	ASCII	EBCDIC	EBCD C1248AB		XS-3	IPARS INPUT = REVERSE HEX	REV EBCD CBA8421		BAUDOT	
			LC	UC			LC	UC	LETTERS	FIGURES
00	NU	NU	(SPACE)	(SPACE)	(SPACE)	(HEX)	(SPACE)	(SPACE)	(HEX)	(HEX)
01	SH	SH	—	—	]	1	1	=	E	3
02	SX	SX	@	(HEX)	—	2	2	<	LF	LF
03	EX	EX	&	+	0	3	3	;	A	—
04	ET	(HEX)	8	*	1	4	4	:	(SPACE)	(HEX)
05	EQ	HT	q	Q	2	5	5	%	S	(HEX)
06	AK	(HEX)	y	Y	3	6	6	'	I	8
07	BL	(HEX)	h	H	4	7	7	>	U	7
08	BS	(HEX)	4	:	5	8	8	*	CR	CR
09	HT	(HEX)	m	M	6	9	9	(	D	$
0A	LF	(HEX)	u	U	7	0	0	)	R	4
0B	VT	VT	d	D	8	*	#	"	J	'
0C	FF	FF	D2	D2	9	(HEX)	[	]	N	,
0D	CR	CR	(HEX)	(HEX)	\	(HEX)	FF	FF	F	!
0E	SO	SO	(HEX)	(HEX)	;	=	^	^	C	:
0F	SI	SI	D4	D4	[	(HEX)	(HEX)	(HEX)	K	(
10	DL	DL	2	<	+	(HEX)	@	(HEX)	T	5
11	D1	D1	k	K	:	(HEX)	/	?	Z	(HEX)
12	D2	D2	s	S	.	S	s	S	L	)
13	D3	D3	b	B	?	T	t	T	W	2
14	D4	(HEX)	0	)	A	U	u	U	H	#
15	NK	(HEX)	#	#	B	V	v	V	Y	6
16	SY	BS	.	.	C	W	w	W	P	0
17	EB	(HEX)	(HEX)	(HEX)	D	X	x	X	Q	1
18	CN	CN	6	'	E	Y	y	Y	O	9
19	EM	EM	o	O	F	Z	z	Z	B	?
1A	SB	(HEX)	w	W	G	—	.	.	G	&
1B	EC	(HEX)	f	F	H	#	,	(HEX)	^	^
1C	FS	FS	^	^	I	(SPACE)	}	{	M	.
1D	GS	GS	BS	BS	=	(HEX)	(HEX)	(HEX)	X	/
1E	RS	RS	(HEX)	(HEX)	<	(HEX)	(HEX)	(HEX)	V	;
1F	US	US	\	\	#	,	(HEX)	(HEX)	\	\

INPUT HEX	ASCII	EBCDIC	EBCD C1248AB		XS-3	IPARS INPUT = REVERSE HEX	REV EBCD CBA8421		BAUDOT	
			LC	UC			LC	UC	LETTERS	FIGURES
20	(SPACE)	(HEX)	1	=	@	@	—	—	(HEX)	(HEX)
21	!	(HEX)	j	J	*	J	j	J	(HEX)	(HEX)
22	"	(HEX)	Λ	?	$	K	k	K	(HEX)	(HEX)
23	#	(HEX)	a	A	!	L	l	L	(HEX)	(HEX)
24	$	(HEX)	9	(	J	M	m	M	(HEX)	(HEX)
25	%	LF	r	R	K	N	n	N	(HEX)	(HEX)
26	&	EB	z	Z	L	O	o	O	(HEX)	(HEX)
27	'	EC	i	I	M	P	p	P	(HEX)	(HEX)
28	(	(HEX)	5	%	N	Q	q	Q	(HEX)	(HEX)
29	)	(HEX)	n	N	O	R	r	R	(HEX)	(HEX)
2A	*	(HEX)	v	V	P	:	#	#	(HEX)	(HEX)
2B	+	(HEX)	e	E	Q	<	$	!	(HEX)	(HEX)
2C	,	(HEX)	RS	RS	R	+	\	Λ	(HEX)	(HEX)
2D	-	EQ	CR	CR	%	(HEX)	CR	CR	(HEX)	(HEX)
2E	.	AK	LF	LF	'	)	BS	BS	(HEX)	(HEX)
2F	/	BL	HT	HT	Λ	(	(HEX)	(HEX)	(HEX)	(HEX)
30	0	(HEX)	3	;	-	$	&	+	(HEX)	(HEX)
31	1	(HEX)	l	L	(	A	a	A	(HEX)	(HEX)
32	2	SY	t	T	,	B	b	B	(HEX)	(HEX)
33	3	(HEX)	c	C	&	C	c	C	(HEX)	(HEX)
34	4	(HEX)	#	"	/	D	d	D	(HEX)	(HEX)
35	5	(HEX)	$	!	S*	E	e	E	(HEX)	(HEX)
36	6	(HEX)	,	3B	T	F	f	F	(HEX)	(HEX)
37	7	ET	.	Λ	U	G	g	G	(HEX)	(HEX)
38	8	(HEX)	7	>	V	H	h	H	(HEX)	(HEX)
39	9	(HEX)	p	P	W	I	i	I	(HEX)	(HEX)
3A	:	(HEX)	x	X	X	?	(HEX)	(HEX)	(HEX)	(HEX)
3B	;	(HEX)	g	G	Y	.	.	(HEX)	(HEX)	(HEX)
3C	<	D4	ET	ET	Z	%	~	`	(HEX)	(HEX)
3D	=	NK	SY	SY	)	(HEX)	(HEX)	(HEX)	(HEX)	(HEX)
3E	>	(HEX)	SH	SH	>	(HEX)	\	\	(HEX)	(HEX)
3F	?	SB	(PAD)	(PAD)	"	(HEX)	(HEX)	(HEX)	(HEX)	(HEX)

* SYNC = even parity S (35_{16}).

INPUT HEX	ASCII	EBCDIC	EBCD C1248AB		XS-3	IPARS INPUT = REVERSE HEX	REV EBCD CBA8421		BAUDOT	
			LC	UC			LC	UC	LETTERS	FIGURES
40	@	(SPACE)	(SPACE)	(SPACE)	(SPACE)	(HEX)	(SPACE)	(SPACE)	(HEX)	(HEX)
41	A	(HEX)	—	—	]	(HEX)	1	=	(HEX)	(HEX)
42	B	(HEX)	@	(HEX)	-	(HEX)	2	<	(HEX)	(HEX)
43	C	(HEX)	&	+	0	(HEX)	3	;	(HEX)	(HEX)
44	D	(HEX)	8	*	1	(HEX)	4	:	(HEX)	(HEX)
45	E	(HEX)	q	Q	2	(HEX)	5	%	(HEX)	(HEX)
46	F	(HEX)	y	Y	3	(HEX)	6	'	(HEX)	(HEX)
47	G	(HEX)	h	H	4	(HEX)	7	>	(HEX)	(HEX)
48	H	(HEX)	4	:	5	(HEX)	8	*	(HEX)	(HEX)
49	I	(HEX)	m	M	6	(HEX)	9	(	(HEX)	(HEX)
4A	J	(HEX)	u	U	7	(HEX)	0	)	(HEX)	(HEX)
4B	K	.	d	D	8	(HEX)	#	"	(HEX)	(HEX)
4C	L	<	D2	D2	9	(HEX)	[	]	(HEX)	(HEX)
4D	M	(	(HEX)	(HEX)	\	(HEX)	FF	FF	(HEX)	(HEX)
4E	N	+	(HEX)	(HEX)	;	(HEX)	Λ	Λ	(HEX)	(HEX)
4F	O	(HEX)	D4	D4	[	(HEX)	(HEX)	(HEX)	(HEX)	(HEX)
50	P	&	2	<	+	(HEX)	@	(HEX)	(HEX)	(HEX)
51	Q	(HEX)	k	K	:	(HEX)	/	?	(HEX)	(HEX)
52	R	(HEX)	s	S	.	(HEX)	s	S	(HEX)	(HEX)
53	S	(HEX)	b	B	?	(HEX)	t	T	(HEX)	(HEX)
54	T	(HEX)	0	)	A	(HEX)	u	U	(HEX)	(HEX)
55	U	(HEX)	#	#	B*	(HEX)	v	V	(HEX)	(HEX)
56	V	(HEX)	.	.	C	(HEX)	w	W	(HEX)	(HEX)
57	W	(HEX)	(HEX)	(HEX)	D	(HEX)	x	X	(HEX)	(HEX)
58	X	(HEX)	6	'	E	(HEX)	y	Y	(HEX)	(HEX)
59	Y	(HEX)	o	O	F	(HEX)	z	Z	(HEX)	(HEX)
5A	Z	!	w	W	G	(HEX)	.	.	(HEX)	(HEX)
5B	[	$	f	F	H	(HEX)	,	(HEX)	(HEX)	(HEX)
5C	\	*	Λ	Λ	I	(HEX)	}	{	(HEX)	(HEX)
5D	]	)	BS	BS	=	(HEX)	(HEX)	(HEX)	(HEX)	(HEX)
5E	Λ	;	(HEX)	(HEX)	<	(HEX)	(HEX)	(HEX)	(HEX)	(HEX)
5F	—	(HEX)	\	\	#	(HEX)	(HEX)	(HEX)	(HEX)	(HEX)

* EOM = even parity B (55_{16}).

INPUT HEX	ASCII	EBCDIC	EBCD C1248AB		XS-3	IPARS INPUT = REVERSE HEX	REV EBCD CBA8421		BAUDOT	
			LC	UC			LC	UC	LETTERS	FIGURES
60	`	—	1	=	@	(HEX)	—	—	(HEX)	(HEX)
61	a	/	j	J	*	(HEX)	j	J	(HEX)	(HEX)
62	b	(HEX)	Λ	?	$	(HEX)	k	K	(HEX)	(HEX)
63	c	(HEX)	a	A	!	(HEX)	l	L	(HEX)	(HEX)
64	d	(HEX)	9	(	J	(HEX)	m	M	(HEX)	(HEX)
65	e	(HEX)	r	R	K	(HEX)	n	N	(HEX)	(HEX)
66	f	(HEX)	z	Z	L	(HEX)	o	O	(HEX)	(HEX)
67	g	(HEX)	i	I	M	(HEX)	p	P	(HEX)	(HEX)
68	h	(HEX)	5	%	N	(HEX)	q	Q	(HEX)	(HEX)
69	i	(HEX).	n	N	O	(HEX)	r	R	(HEX)	(HEX)
6A	j	¦	v	V	P	(HEX)	#	#	(HEX)	(HEX)
6B	k	,	e	E	Q	(HEX)	$	!	(HEX)	(HEX)
6C	l	%	RS	RS	R	(HEX)	\	Λ	(HEX)	(HEX)
6D	m	_	CR	CR	%	(HEX)	CR	CR	(HEX)	(HEX)
6E	n	>	LF	LF	'	(HEX)	BS	BS	(HEX)	(HEX)
6F	o	?	HT	HT	Λ	(HEX)	(HEX)	(HEX)	(HEX)	(HEX)
70	p	(HEX)	3	;	_	(HEX)	&	+	(HEX)	(HEX)
71	q	(HEX)	l	L	(	(HEX)	a	A	(HEX)	(HEX)
72	r	(HEX)	t	T	,	(HEX)	b	B	(HEX)	(HEX)
73	s	(HEX)	c	C	&	(HEX)	c	C	(HEX)	(HEX)
74	t	(HEX)	#	"	/	(HEX)	d	D	(HEX)	(HEX)
75	u	(HEX)	$	!	S	(HEX)	e	E	(HEX)	(HEX)
76	v	(HEX)	,	(HEX)	T	(HEX)	f	F	(HEX)	(HEX)
77	w	(HEX)	.	Λ	U	(HEX)	g	G	(HEX)	(HEX)
78	x	(HEX)	7	>	V	(HEX)	h	H	(HEX)	(HEX)
79	y	`	p	P	W	(HEX)	i	I	(HEX)	(HEX)
7A	z	:	x	X	X	(HEX)	(HEX)	(HEX)	(HEX)	(HEX)
7B	{	#	g	G	Y	(HEX)	.	(HEX)	(HEX)	(HEX)
7C	¦	@	ET	ET	Z	(HEX)	~	`	(HEX)	(HEX)
7D	}	'	SY	SY	)	(HEX)	(HEX)	(HEX)	(HEX)	(HEX)
7E	~	=	SH	SH	>	(HEX)	\	\	(HEX)	(HEX)
7F	(PAD) DEL	"	(PAD) DEL	(PAD) DEL	"	(HEX)	(HEX)	(HEX)	(HEX)	(HEX)

INPUT HEX	ASCII	EBCDIC	EBCD C1248AB		XS-3	IPARS INPUT = REVERSE HEX	REV EBCD CBA8421		BAUDOT	
			LC	UC			LC	UC	LETTERS	FIGURES
80	NU	(HEX)			(HEX)	(HEX)				
81	SH	a			(HEX)	(HEX)				
82	SX	b			(HEX)	(HEX)				
83	EX	c			(HEX)	(HEX)				
84	ET	d			(HEX)	(HEX)				
85	EQ	e			(HEX)	(HEX)				
86	AK	f			(HEX)	(HEX)				
87	BL	g			(HEX)	(HEX)				
88	BS	h			(HEX)	(HEX)				
89	HT	i			(HEX)	(HEX)				
8A	LF	(HEX)			(HEX)	(HEX)				
8B	VT	(HEX)			(HEX)	(HEX)				
8C	FF	(HEX)			(HEX)	(HEX)				
8D	CR	(HEX)			(HEX)	(HEX)				
8E	SO	(HEX)			(HEX)	(HEX)				
8F	SI	(HEX)			(HEX)	(HEX)				
90	DL	(HEX)			(HEX)	(HEX)				
91	D1	j			(HEX)	(HEX)				
92	D2	k			(HEX)	(HEX)				
93	D3	l			(HEX)	(HEX)				
94	D4	m			(HEX)	(HEX)				
95	NK	n			(HEX)	(HEX)				
96	SY	o			(HEX)	(HEX)				
97	EB	p			(HEX)	(HEX)				
98	CN	q			(HEX)	(HEX)				
99	EM	r			(HEX)	(HEX)				
9A	SB	(HEX)			(HEX)	(HEX)				
9B	EC	(HEX)			(HEX)	(HEX)				
9C	FS	(HEX)			(HEX)	(HEX)				
9D	GS	(HEX)			(HEX)	(HEX)				
9E	RS	(HEX)			(HEX)	(HEX)				
9F	US	(HEX)			(HEX)	(HEX)				

INPUT HEX	ASCII	EBCDIC	EBCD C1248AB		XS-3	IPARS INPUT = REVERSE HEX	REV EBCD CBA8421		BAUDOT	
			LC	UC			LC	UC	LETTERS	FIGURES
A0	(SPACE)	(HEX)			(HEX)	(HEX)				
A1	!	~			(HEX)	(HEX)				
A2	"	s			(HEX)	(HEX)				
A3	#	t			(HEX)	(HEX)				
A4	$	u			(HEX)	(HEX)				
A5	%	v			(HEX)	(HEX)				
A6	&	w			(HEX)	(HEX)				
A7	'	x			(HEX)	(HEX)				
A8	(	y			(HEX)	(HEX)				
A9	)	z			(HEX)	(HEX)				
AA	*	(HEX)			(HEX)	(HEX)				
AB	+	(HEX)			(HEX)	(HEX)				
AC	,	(HEX)			(HEX)	(HEX)				
AD	-	(HEX)			(HEX)	(HEX)				
AE	.	(HEX)			(HEX)	(HEX)				
AF	/	(HEX)			(HEX)	(HEX)				
B0	0	(HEX)			(HEX)	(HEX)				
B1	1	(HEX)			(HEX)	(HEX)				
B2	2	(HEX)			(HEX)	(HEX)				
B3	3	(HEX)			(HEX)	(HEX)				
B4	4	(HEX)			(HEX)	(HEX)				
B5	5	(HEX)			(HEX)	(HEX)				
B6	6	(HEX)			(HEX)	(HEX)				
B7	7	(HEX)			(HEX)	(HEX)				
B8	8	(HEX)			(HEX)	(HEX)				
B9	9	(HEX)			(HEX)	(HEX)				
BA	:	(HEX)			(HEX)	(HEX)				
BB	;	(HEX)			(HEX)	(HEX)				
BC	<	(HEX)			(HEX)	(HEX)				
BD	=	(HEX)			(HEX)	(HEX)				
BE	>	(HEX)			(HEX)	(HEX)				
BF	?	(HEX)			(HEX)	(HEX)				

INPUT HEX	ASCII	EBCDIC	EBCD C1248AB		XS-3	IPARS INPUT = REVERSE HEX	REV EBCD CBA8421		BAUDOT	
			LC	UC			LC	UC	LETTERS	FIGURES
C0	@	{			(HEX)	(HEX)				
C1	A	A			(HEX)	(HEX)				
C2	B	B			(HEX)	(HEX)				
C3	C	C			(HEX)	(HEX)				
C4	D	D			(HEX)	(HEX)				
C5	E	E			(HEX)	(HEX)				
C6	F	F			(HEX)	(HEX)				
C7	G	G			(HEX)	(HEX)				
C8	H	H			(HEX)	(HEX)				
C9	I	I			(HEX)	(HEX)				
CA	J	(HEX)			(HEX)	(HEX)				
CB	K	(HEX)			(HEX)	(HEX)				
CC	L	(HEX)			(HEX)	(HEX)				
CD	M	(HEX)			(HEX)	(HEX)				
CE	N	(HEX)			(HEX)	(HEX)				
CF	O	(HEX)			(HEX)	(HEX)				
D0	P	}			(HEX)	(HEX)				
D1	Q	J			(HEX)	(HEX)				
D2	R	K			(HEX)	(HEX)				
D3	S	L			(HEX)	(HEX)				
D4	T	M			(HEX)	(HEX)				
D5	U	N			(HEX)	(HEX)				
D6	V	O			(HEX)	(HEX)				
D7	W	P			(HEX)	(HEX)				
D8	X	Q			(HEX)	(HEX)				
D9	Y	R			(HEX)	(HEX)				
DA	Z	(HEX)			(HEX)	(HEX)				
DB	[	(HEX)			(HEX)	(HEX)				
DC	\	(HEX)			(HEX)	(HEX)				
DD	]	(HEX)			(HEX)	(HEX)				
DE	^	(HEX)			(HEX)	(HEX)				
DF	–	(HEX)			(HEX)	(HEX)				

INPUT HEX	ASCII	EBCDIC	EBCD C1248AB		XS-3	IPARS INPUT = REVERSE HEX	REV EBCD CBA8421		BAUDOT	
			LC	UC			LC	UC	LETTERS	FIGURES
E0	`	\			(HEX)	(HEX)				
E1	a	E1			(HEX)	(HEX)				
E2	b	S			(HEX)	(HEX)				
E3	c	T			(HEX)	(HEX)				
E4	d	U			(HEX)	(HEX)				
E5	e	V			(HEX)	(HEX)				
E6	f	W			(HEX)	(HEX)				
E7	g	X			(HEX)	(HEX)				
E8	h	Y			(HEX)	(HEX)				
E9	i	Z			(HEX)	(HEX)				
EA	j	(HEX)			(HEX)	(HEX)				
EB	k	(HEX)			(HEX)	(HEX)				
EC	l	(HEX)			(HEX)	(HEX)				
ED	m	(HEX)			(HEX)	(HEX)				
EE	n	(HEX)			(HEX)	(HEX)				
EF	o	(HEX)			(HEX)	(HEX)				
F0	p	0			(HEX)	(HEX)				
F1	q	1			(HEX)	(HEX)				
F2	r	2			(HEX)	(HEX)				
F3	s	3			(HEX)	(HEX)				
F4	t	4			(HEX)	(HEX)				
F5	u	5			(HEX)	(HEX)				
F6	v	6			(HEX)	(HEX)				
F7	w	7			(HEX)	(HEX)				
F8	x	8			(HEX)	(HEX)				
F9	y	9			(HEX)	(HEX)				
FA	z	(HEX)			(HEX)	(HEX)				
FB	{	(HEX)			(HEX)	(HEX)				
FC	¦	(HEX)			(HEX)	(HEX)				
FD	}	(HEX)			(HEX)	(HEX)				
FE	~	(HEX)			(HEX)	(HEX)				
FF	(PAD)	(HEX)			(HEX)	(HEX)				

APPENDIX C
3500 Error Messages

The following error messages all pertain to the tape and thus are not applicable to the INTERVIEW 3000.

Message and Code	Comments
TAPE NOT INSTALLED (01)	Power-up display. Will also appear if tape load point hole is over tape hole sensor.
TAPE IS WRITE PROTECTED (02)	If RECORD command is given while RECORD tab on tape is in nonrecord position. Will also be seen if operator attempts to monitor tape when LINE is selected as source.
REWIND ATTEMPT FAILED (03)	Tape may have run off reel.
NO PROGRAM FOUND (04)	Tape contains no recorded program.
INVALID TAPE COMMAND (05)	Unlikely to be seen.
TAPE DCE BUFFER OVERFLOW (06) TAPE DTE BUFFER OVERFLOW (07) TAPE RECORD OVERRUN (08)	May be seen if operator tries to record interface lead status at 19.2 kbps. May appear during playback if a block has been only partially recorded and the rest of the data is not recognizable. Also occurs if recording is attempted when clock is not present for both TD and RD, as when modems are strapped for new sync. In this case, derived clock must be used: select INTernal clock and the appropriate line speed. Split-speed circuits may not be recorded and will always generate TAPE OVERRUN error messages.
TAPE PLAY OVERRUN (09) TAPE PLAY OVERRUN (10) TAPE PLAY OVERRUN (11) TAPE PLAY OVERRUN (12)	If EIA lead status has been recorded, maximum playback speed is 9.6 kbps.
DUMMY ERR, SOFTWARE TEST (13)	Unlikely to be seen.
BLOCK NOT FOUND (14)	Tape not recorded to block sought.
TAPE CHECKSUM ERROR	Unit could not read program from tape. When this message appears several times after SAVE PROGram is operated, the tape may be defective, or the tape head may need cleaning (see Section 16.4).

APPENDIX D
Trigger Summary Work Sheet

DATE _____
NAME _____

INTERVIEW 3500 TRIGGER WORK SHEET

TEST ID _____

#1

NEITHER / DTE / DCE ? STRG / 1 OF _____ / GOOD FCS / FCS ERROR ? IF LEADS ? FLAG ?# ___ ON / OFF
BIT MASK: ☐☐☐☐☐☐☐☐
A ? OUT SYNC ? CRT ? ☐☐☐☐☐☐ TAPE ? ON / OFF CTR ?# ___ INC / DEC / RES TIMER ?# ___ RSTRT / CONT / STOP FLAG ?# ___ ON / OFF

#2

NEITHER / DTE / DCE ? STRG / 1 OF _____ / GOOD FCS / FCS ERROR ? IF LEADS ? FLAG ?# ___ ON / OFF
BIT MASK: ☐☐☐☐☐☐☐☐
A ? OUT SYNC ? CRT ? ☐☐☐☐☐☐ TAPE ? ON / OFF CTR ?# ___ INC / DEC / RES TIMER ?# ___ RSTRT / CONT / STOP FLAG ?# ___ ON / OFF

#3

NEITHER / DTE / DCE ? STRG / 1 OF _____ / GOOD FCS / FCS ERROR ? IF LEADS ? FLAG ?# ___ ON / OFF
BIT MASK: ☐☐☐☐☐☐☐☐
A ? OUT SYNC ? CRT ? ☐☐☐☐☐☐ TAPE ? ON / OFF CTR ?# ___ INC / DEC / RES TIMER ?# ___ RSTRT / CONT / STOP FLAG ?# ___ ON / OFF

#4

NEITHER / DTE / DCE ? STRG / 1 OF _____ / GOOD FCS / FCS ERROR ? IF LEADS ? FLAG ?# ___ ON / OFF
BIT MASK: ☐☐☐☐☐☐☐☐
A ? OUT SYNC ? CRT ? ☐☐☐☐☐☐ TAPE ? ON / OFF CTR ?# ___ INC / DEC / RES TIMER ?# ___ RSTRT / CONT / STOP FLAG ?# ___ ON / OFF

#5

NEITHER / DTE / DCE ? STRG / 1 OF _____ / GOOD FCS / FCS ERROR ? IF LEADS ? FLAG ?# ___ ON / OFF
BIT MASK: ☐☐☐☐☐☐☐☐
A ? OUT SYNC ? CRT ? ☐☐☐☐☐☐ TAPE ? ON / OFF CTR ?# ___ INC / DEC / RES TIMER ?# ___ RSTRT / CONT / STOP FLAG ?# ___ ON / OFF

#6

NEITHER / DTE / DCE ? STRG / 1 OF _____ / GOOD FCS / FCS ERROR ? IF LEADS ? FLAG ?# ___ ON / OFF
BIT MASK: ☐☐☐☐☐☐☐☐
A ? OUT SYNC ? CRT ? ☐☐☐☐☐☐ TAPE ? ON / OFF CTR ?# ___ INC / DEC / RES TIMER ?# ___ RSTRT / CONT / STOP FLAG ?# ___ ON / OFF

#7

NEITHER / DTE / DCE ? STRG / 1 OF _____ / GOOD FCS / FCS ERROR ? IF LEADS ? FLAG ?# ___ ON / OFF
BIT MASK: ☐☐☐☐☐☐☐☐
A ? OUT SYNC ? CRT ? ☐☐☐☐☐☐ TAPE ? ON / OFF CTR ?# ___ INC / DEC / RES TIMER ?# ___ RSTRT / CONT / STOP FLAG ?# ___ ON / OFF

#8

NEITHER / DTE / DCE ? STRG / 1 OF _____ / GOOD FCS / FCS ERROR ? IF LEADS ? FLAG ?# ___ ON / OFF
BIT MASK: ☐☐☐☐☐☐☐☐
A ? OUT SYNC ? CRT ? ☐☐☐☐☐☐ TAPE ? ON / OFF CTR ?# ___ INC / DEC / RES TIMER ?# ___ RSTRT / CONT / STOP FLAG ?# ___ ON / OFF

APPENDIX E
Rack Mount Kit

A Rack Mount Kit (INTERVIEW option OPT-895-02-1) is offered to allow either the INTERVIEW 3000 or the INTERVIEW 3500 to be installed in a standard 19-inch wide equipment rack.

E.1 GENERAL DESCRIPTION

The kit will fit either standard vertical or sloped-front-panel, low-boy racks. Please note that, for proper installation, the rack must be equipped with a horizontal writing shelf (see Figure E-1).

The Rack Mount Kit offers the user four basic mounting styles:

(1) Secure mounting, with flat keyboard position.
(2) Secure mounting, with sloped keyboard position.
(3) Slide-in/out mounting, with flat keyboard position.
(4) Slide-in/out mounting, with sloped keyboard position.

Physical Specifications:

Height, 8.75 inches
Width, 19.0 inches
Depth, 17.4 inches
Weight, 20 lb
Material, Steel, with ABS plastic fittings

E.2 INSTALLATION

Installation is accomplished as follows:

1. Remove the carrying handle and detent mechanism from the INTERVIEW, following drawing TP-895-SA-43564.
2. Remove the top plate assembly from the rack mount kit.
3. Fit the INTERVIEW into the main frame of the rack mount kit.
4. Reinstall the top plate assembly.
5. Attach the two half-moon trim pieces.
6. Install the unit in the equipment rack.

Detailed, step-by-step instructions and exploded views are provided on drawings TP-895-SA-43564 and TP-895-32178. Copies of these drawings are shipped with the Rack Mount Kit.

Total time for the installation should be less than one hour.

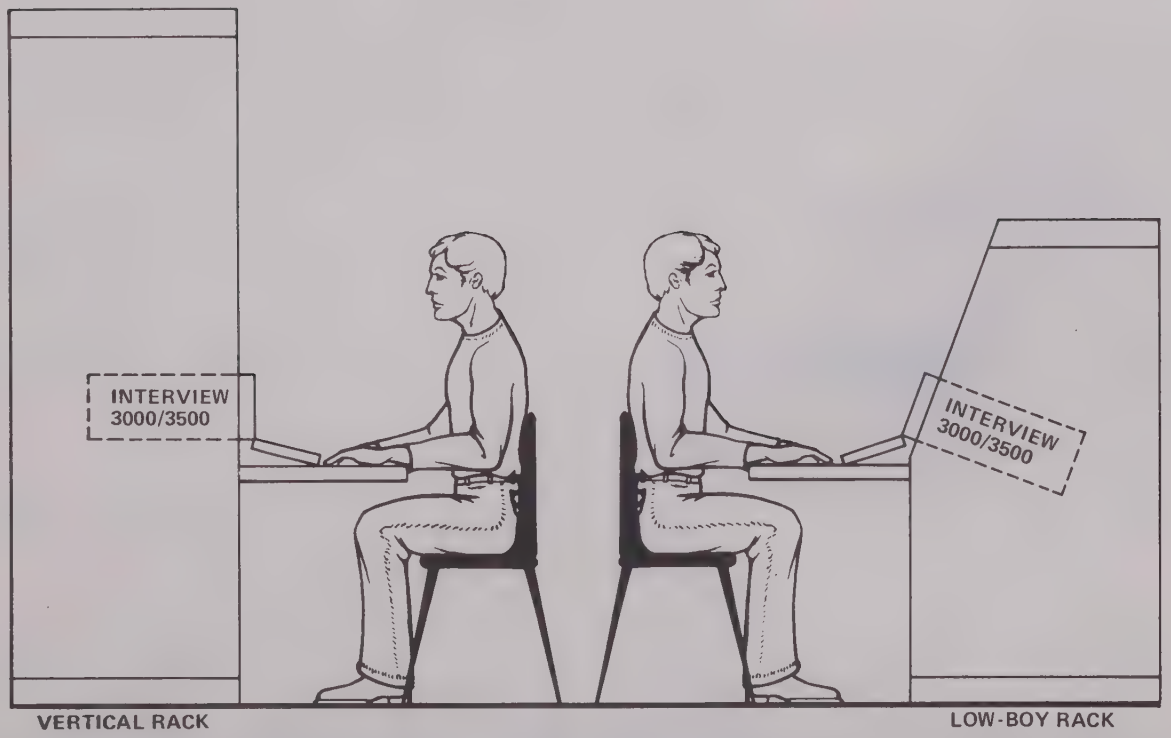

Figure E-1 INTERVIEW installed in equipment racks. Left, vertical rack; right, low-boy rack.

APPENDIX F
Accessories

INTERVIEW 3000

MODEL	DESCRIPTION
INT-895-1	INTERVIEW 3000. Portable. Supplied with: Operator's Manual ATLC-107-895-100 Technical Manual ATLC-107-895-101 ASYNC Training Manual ATLC-107-895-103 BISYNC Training Manual ATLC-107-895-102 BOP Training Manual ATLC-107-895-104 RS-232/V.24 "T" Ribbon Cable & Power Cord.

OPTIONS

MODEL	DESCRIPTION
OPT-895-01-1	Tape Upgrade Kit, 3000 to 3500: Installed prior to initial delivery
OPT-895-01-2	Factory or field installed after initial delivery
OPT-895-02-1	Rackmount Shelf Kit
ARC-37408	Travel Bag

INTERVIEW 3500

MODEL	INTERVIEW 3500. PORTABLE (For Rackmount, include OPT-895-02-1)
	Supplied with: Same accessories as INTERVIEW 3000 but also includes: BISYNC Training Tape TAP-895-102-1 ASYNC Training Tape TAP-895-103-1 BOP Training Tape TAP-895-104-1 Blank Tape ARC-37784

OPTIONS

MODEL	DESCRIPTION
	Same options as INTERVIEW 3000 but also includes:
OPT-895-09-L	Tape Output Cable
ARC-37408	Travel Bag
	Extra Tapes or Manuals may be ordered by using model numbers specified with each item. Extra tapes from ARC are sold in boxes of five. Tapes can be purchased from local 3M or other distributor.
OPT-895-08-5	Interface Adapter Kit, DTM SERIES J
OPT-895-08-6	Planned. Interface Adapter Kit, DTM SERIES J, W/M550/555
OPT-895-08-7	Planned. Interface Adapter Kit, DTM SERIES J, W/IPARS
OPT-895-08-8	Planned. Interface Adapter Kit, DTM SERIES J, W/IPARS & M550/555

APPENDIX G
Acronyms and Abbreviations*

ASYNC	ASYNChronous format (includes START and STOP bits)
AUTOSYNC	Automatically recognizes synchronization pattern as 16-bit pattern
AUX	Auxiliary
BDLC	Burroughs Data Link Control
BISYNC	Binary Synchronous Communications Protocol (IBM); also BSC
BLI	BLInk (CRT enhancement)
BOP	Bit-Oriented Protocols, e.g., HDLC, bit stuffing
bps	bits per second
CCITT	Consultive Committee, International Telephone and Telegraph
CHARS	CHARacterS
CRT	Cathode Ray Tube
D	D bit (Bit 7 in Octet 3 of packet-level X.25)
DB-25	25 Pin connector (standard for RS-232/V.24)
DC	Don't Care character (keyboard key); also Device Control
DCE	Data Communications Equipment
DEC	DECrement
DLE	Data Link Escape (used principally in transparent BISYNC)
DSR	Data Set Ready (RS-232/V.24 control lead)
DTE	Data Terminal Equipment
EIA	Electronic Industries Association
FDX	Full Duplex (permits simultaneous data in both directions)
FCS	Frame Check Sequence (used in BOP)
Flag	HDLC 7E framing
FLAG	*Flag* key
HDLC	High Level Data Link Control procedure
HEX	HEXadecimal key
Hz	Hertz
ID	IDentification
INC	INCrement
INFO	INFOrmation (usually refers to a type of frame)
kbps	Kilobits per second
LCN	Logical Channel Number (X.25 packet-level term)
LO	LOw intensity (CRT enhancement)
M	M bit (X.25 packet-level, Bit 4 of Octet 3)
MIL-188	Military Specification 188
MOD	MODulus (number of outstanding frames or packets, usually 8)
MON	MONitor mode
N(R)	Number Received (frames)

* See also Tables 9-1 and 9-2.

NRZI	Non-Return to Zero Inverted (used with SDLC and ASYNC modems-sometimes with clocked modems)
N(S)	Number Sent (frames)
OUTSYNC	OUT of SYNChronization
P/F	Poll/Final bit used in control byte at frame level (HDLC/SDLC)
P(R)	Packet Received
P(S)	Packet Sent
Q	Q bit (Bit 8 of Octet 1 in packet-level X.25)
RD	Received Data
REV	REVerse (black character on white background on CRT)
RLSD	Received Line Signal Detect (RS-232/V.24 signal)
ROM	Read Only Memory (firmware/software storage)
RS-232/V.24	List of definitions for interchange circuit between data terminal equipment and data circuit termination equipment established by EIA
SDLC	Synchronous Data Link Control (IBM); analogous to frame level
SNA	System Network Architecture (IBM); analogous to packet level
SY, SYNC	Abbreviations for synchronization character in the code set (SY used in CRT font)
SYNC	SYNChronous format (as distinct from ASYNC or BOP)
TD	Transmitted Data
TP	Test Point
TX	Transmit Message
UND	Underline (CRT enhancement)

APPENDIX H
Interview 3500 Specifications

DISPLAY 18 40-byte lines
- Data: 640 bytes (16 40-byte lines)
- Buffer: 1920 bytes
- Speed: To 72 kbps FDX in single-line mode with ext. clock
  To 19.2 kbps FDX in dual-line mode

TAPE
- Capacity: Program plus 600 kbytes data
  Program plus 400 kbytes data when RS-232/V.24 lead status recorded
- Playback speed: 9600 bps
- Recording speed: To 19.2 kbps for FDX data
  To 9.6 kbps for FDX data with RS-232/V.24 lead status
- RS-232/V.24 tape output: When tape is played, all recorded signals are presented at the AUX connector as RS-232/V.24 signals. An adapter cable OPT-895-09-L provides these signals at a DB-25 connector for interconnection into a standard data environment.

TRIGGERS

Each of the 8 triggers may simultaneously look for any or all of the conditions listed below and take any or all of the listed actions when the conditions occur.

- Conditions: Character strings—8 characters per string with Bit Mask, Don't Care, and Not Equal character entries available.
  RS-232/V.24 interface lead status—mask of up to 7 leads
  Internal flags
- Actions: Control CRT—enhance, freeze, or clear CRT
  Control tape—selectively enable and disable tape
  Set internal flags
  Control timers—restart, continue, or stop timers
  Control counters—increment, decrement, reset counters
  Sound audible alarm
  Force receiver out of sync
- Activity: At 9.6 kbps FDX, eight active simultaneously; at 56 kbps FDX, approximately two
- Interface leads monitored: RTS, CTS, DSR, RLSD, DTR, RI, STRAP (user assigned)

COUNTERS Four, max. count 65,535

TIMERS Two, increment in seconds or milliseconds, max. 65,535

STANDARD CODES EBCDIC, ASCII, EBCD, XS-3, IPARS, reverse EBCD, Baudot, hexadecimal

BIT-ORIENTED PROTOCOL ANALYSIS X.25 frame- and packet-level mnemonic expansions displayed in freeze mode

INTERFACES RS-232/V.24. Also X.21, V.35, RS-449, Bell 303 with adapters

SIGNAL CONNECTORS RS-232/V.24. One male and one female DB-25 connector on rear of unit

LEAD STATUS DISPLAY for all RS-232/V.24 leads

VIDEO OUTPUT SIGNALS Remote video monitor or video printer can be connected to rear BNC connector which provides EIA RS-170 composite video.

ELECTRICAL
- Power: 115 or 230 V ± 10%; 50 or 60 Hz, selectable.
- Input Impedance: >30 k Ω
- Input voltage: ± 25 V max
- Input threshold: ∼ + 3 V

DIMENSIONS
- Portable: 19 in. (48.3 cm) wide
  20¼ in. (51.4 cm) deep
  7 in. (17.8 cm) high
- Rack Mounted: 19 in. (48.2 cm) wide
  17¼ in. (43.8 cm) deep
  8¾ in. (22.2 cm) high

WEIGHT
- INTERVIEW 3000: 30.5 lb (13.8 kg)
- INTERVIEW 3500: 31.5 lb (14.3 kg)

APPENDIX I
Interview 3500 Options

I.1 ENHANCED X.25-DLC SOFTWARE (OPTION-895-10-1)

Appendix I is in preparation

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ATLC-107-895-102
Issue 2, March 1981

BISYNC TRAINING MANUAL FOR INTERVIEW® 3000 and 3500

Atlantic Research Corporation Teleproducts Division
5390 Cherokee Avenue, Alexandria, Virginia 22314

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Notice

This training manual is intended for use with Series B 3500 units of software level 3.04 and BISYNC Training Tape TAP-895-102-1.4. Units prior to Series B require an interim tape, TAP-895-102-1.A. When these units are upgraded to Series B, the standard tape, 102-1.4 can be used. Data recorded with any 3500 software may be played back in units of any software level. Recorded programs are "upward compatible"; that is, programs recorded with earlier software will load and run in a 3.04 unit, but programs saved in a 3.04 unit will not load into units with earlier software.

Atlantic Research Corporation reserves the right to make improvements to the product, manual, and tape without prior notice. Further tape revisions, beyond 102-1.4, will not necessarily affect correlation with this manual.

Any duplication of this material in any form without prior authorization of Atlantic Research Corporation is strictly prohibited.

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Appendix A: INTERVIEW 3000 31

INTERVIEW 3500

1 Introduction

The INTERVIEW 3500 is a powerful, fully programmable monitor as well as an independently programmable Data Recorder. In addition to accommodating 4 million bits of data, the tape stores the analysis program in a protected area, and saves a complete set of program parameters.

1.1 SCOPE OF MANUAL

This training manual, in conjunction with BISYNC training tape TAP-895-102-1.4, is intended to teach an operator how to use the INTERVIEW 3500 in a BISYNC protocol environment. Since a self-teaching format is used, the reader must proceed through the manual in the given sequence.

Because most field users will have access to programs already developed by themselves or by their home offices, we have based the course on the existence of such a tape. The operator will begin his training with an existing program, then learn how to edit it, and finally how to develop a new program.

The INTERVIEW 3000 user will find that the numerous CRT display reproductions enable him to use this basic course also. Appendix A explains how he should proceed.

The Technical Manual, ATLC-107-895-101, should be consulted for specifications and details of the operation of the 3500 (or 3000). Other reference documents should be reviewed for in-depth treatment of specific protocols and interface standards.

Using this manual and the training tape, an operator should accomplish the following:

- 10-30 minutes: operate the 3500 and display BISYNC data.
- 1-2 hours: enhance data and use the network performance capabilities of an existing program.
- 2-3 hours: modify existing programs and conduct extemporaneous program diagnostics and performance measurements.

An extremely important consideration to any training activity is retention. With 3-4 hours' training from this manual and tape an operator can use the 3500 effectively after a "vacation" of 2-3 weeks because the logically and functionally labeled operations follow so intuitively and there is no "instruction" set to memorize or look up.

The remainder of Section 1 presents a general nonoperating overview of the INTERVIEW 3500. The reader will become familiar with the major operational controls and indicators. Beginning with Section 2, he will interact with the instrument in various operational modes.

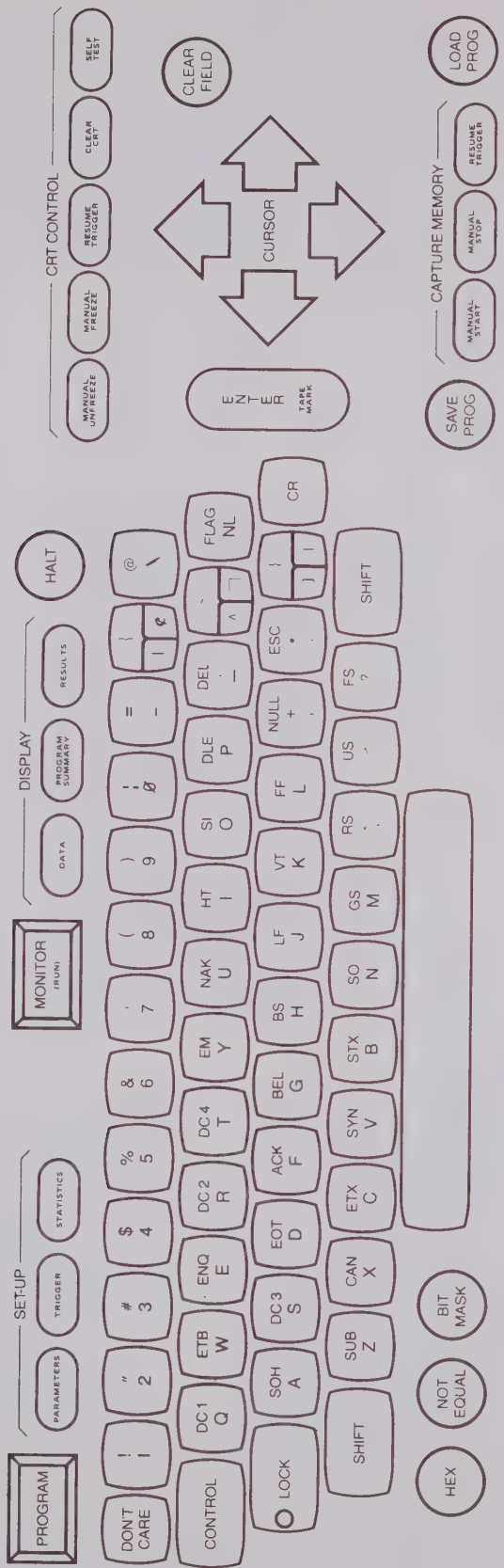
PROGRAM
SET-UP
PARAMETERS
TRIGGER
STATISTICS
MONITOR
(RUN)
DISPLAY
DATA
PROGRAM SUMMARY
RESULTS
HALT
CRT CONTROL
MANUAL UNFREEZE
MANUAL FREEZE
RESUME TRIGGER
CLEAR CRT
SELF TEST
CLEAR FIELD
CURSOR
ENTER
TAPE MARK
CAPTURE MEMORY
MANUAL START
MANUAL STOP
RESUME TRIGGER
LOAD PROG
SAVE PROG
DON'T CARE
CONTROL
LOCK
SHIFT
HEX
NOT EQUAL
BIT MASK
FLAG NL
CR
SHIFT

Figure 1-1

Figures show typical CRT displays. Negative reproductions of the displays have been used because they offer better definition in print than do positives. The tape block numbers may vary between the training tape and figures in this manual because of the buffering and the operator's response time; however, the content of each figure will still illustrate the point.

1.2 HUMAN INTERFACE

The operator interacts with the 3500 via the keyboard and the 7-inch CRT display.

Each control key is clearly labeled by function.

With only a glance at the two CRT status lines and the status LED zone of the front panel the operator will quickly understand what mode the 3500 is in, what it is doing, and why.

An audible beeper confirms proper operator key actions and calls attention to illegal key actions.

1.3 KEYBOARD

Familiarize yourself with the keyboard (Figure 1-1). Notice especially the following significant features:

- Full ASCII typewriter-terminal keyboard layout.
- Blue keys are those used for HEX (and the most often used protocol control characters).
- Red keys are used primarily in the program mode.
- Green keys are used in the monitor mode and are grouped in three zones for--

  Display selections,
  CRT control,
  CAPTURE MEMORY control (e.g., tape).

- Rectangular Red and Green keys are the mode entry keys:

PROGRAM = RED; MONITOR = GREEN.

Notes:

1. Some keys will repeat when held down (e.g., cursors).
2. The CONTROL key must be held down while a key for a protocol control character is operated.
3. Some keys are alternate action (e.g., CRT SELF TEST and HEX in monitor mode).
4. Some keys are single function latch (e.g., HEX key accepts the next two keys as HEX in program mode).
5. Refer to the Technical Manual for full key specifications.

1.4 PANEL

The right STATUS zone of the front panel clearly identifies the CRT display and tape activity (Figure 1-2).

A FREEZE indicator quickly verifies that the CRT display is supposed to be frozen and whether the cause is a manual request by the operator or a program trigger has taken action.

A RECORD indicator verifies that the tape is recording at the direction of the operator manually or via a program trigger.

The left STATUS zone of the front panel provides additional functionally

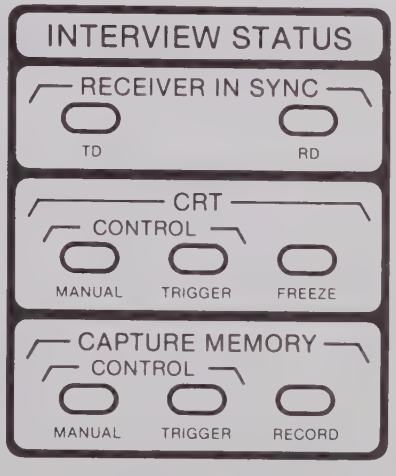

Figure 1-2

labeled indicators for the RS-232/V.24 interface signals (Figure 1-3).

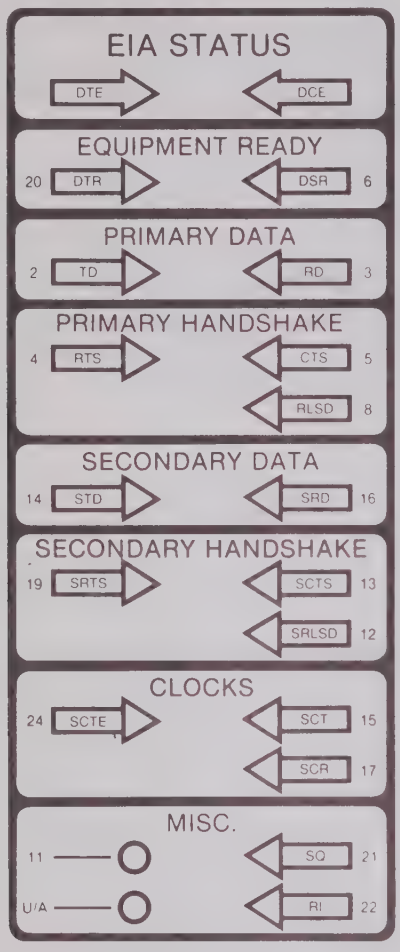

Figure 1-3

1.5 CRT DISPLAY

The top two lines of the CRT display are reserved for status information for the operator.

Sixteen lines are provided for data display and program menus. Each line contains 40 characters for a total data display of 640 characters.

A buffer holds three displays of data (1920 characters). The CRT window of 640 characters can be scrolled through this buffer line by line.

1.6 PROGRAMMING CONCEPT

A unique nonsequential programming concept eliminates the requirement for the operator to learn programming. Terms such as addresses, steps, jumps, interrupts, conditional tests, and instructions are not used at all because a simpler and more powerful method is provided.

Basically, the operator defines a situation he wants to look for and what action (or actions) should follow. This capability is called a trigger. Eight triggers are available. All eight triggers can look for independent nonrelated conditions (e.g., character strings) simultaneously and can take independent and (or) interrelated actions (counters, timers, CRT control, tape control, etc.).

The operator simply indicates what the 3500 is to do. There are no sequential program steps or flow charts required, and no list of instructions or commands to remember.

2 Power-Up

2.1 WITHOUT TAPE INSERTED

1. Operate the red power switch. The CRT will show the display of Figure 2-1. If an error is found during the power-up interactive diagnostics between the internal microprocessors, a code indicative of the defective subassembly will be displayed under SELF TEST. Refer to the Technical Manual for a list of the error codes.

The operator may use only the PROGRAM key or the MONITOR key. Any other key will cause a KEY ERROR response on line 2 of the display and an audible signal. KEY ERROR clears after 3 seconds or when a correct key is operated.

2. Verify this response by operating a numeric key.

NOTE: On power-up without tape inserted, the program defaults to basic BISYNC parameters.

3. Operate the MONITOR key and observe the display (Figure 2-2). On the top line are the mode, MON, signal source, LINE, and tape BLOCK number. The second line shows that the specific signal the monitor is expecting on BOTH the DCE and DTE circuits is EBCDIC, SYNChronous, with sync characters of 32_{16}, 32_{16}.

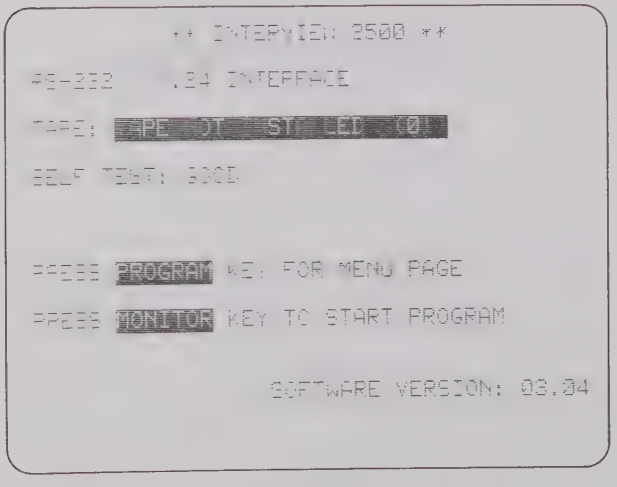
** INTERVIEW 2500 **
RS-232 .34 INTERFACE
SELF TEST: GOOD
PRESS PROGRAM KEY FOR MENU PAGE
PRESS MONITOR KEY TO START PROGRAM
SOFTWARE VERSION: 03.04

Figure 2-1

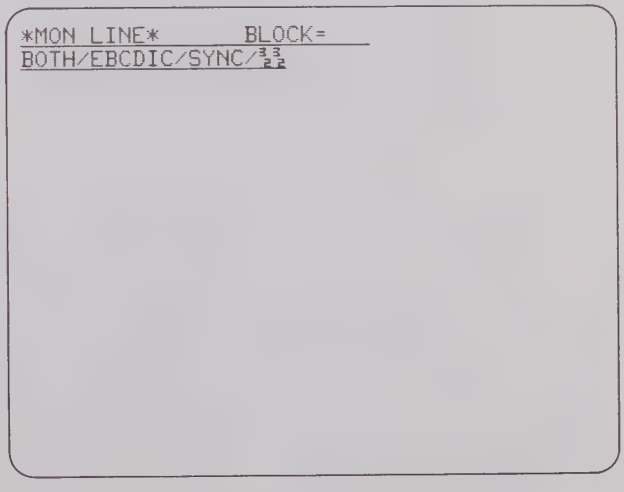

Figure 2-2

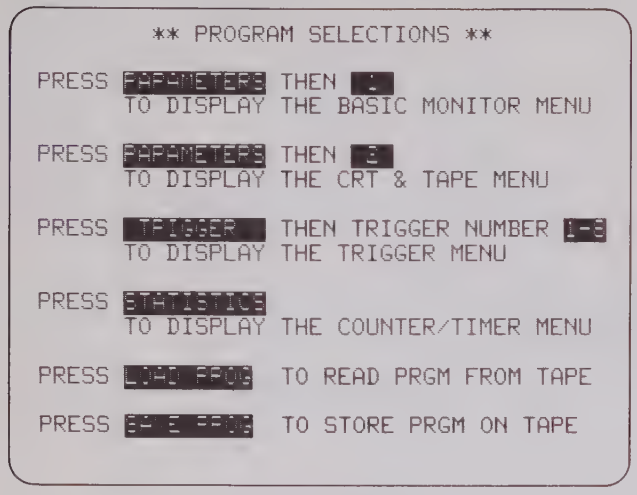
** PROGRAM SELECTIONS **
PRESS PARAMETERS THEN 1
TO DISPLAY THE BASIC MONITOR MENU
PRESS PARAMETERS THEN 3
TO DISPLAY THE CRT & TAPE MENU
PRESS TRIGGER THEN TRIGGER NUMBER 1-3
TO DISPLAY THE TRIGGER MENU
PRESS STATISTICS
TO DISPLAY THE COUNTER/TIMER MENU
PRESS LOAD PROG TO READ PRGM FROM TAPE
PRESS STORE PROG TO STORE PRGM ON TAPE

Figure 2-3

You could now apply a BISYNC signal to the rear connector and the data would be displayed.

4. Operate the PROGRAM key and observe the display (Figure 2-3).

NOTE: You may use the PROGRAM key at any time in any mode to provide a known basic starting point.

Notice that the menu permits only five keys to be operated. All programming is accomplished through the Parameters, Trigger, or Statistics menus described throughout this manual.

The bottom two selections permit you to SAVE a program on tape or LOAD a taped program.

2.2 TAPE INSERTED AFTER POWER-UP

1. Check that the RECORD tab on the tape cartridge is not in the record position (the tab should be toward the center of the cartridge). Insert the BISYNC training tape with the drive wheel to the rear and the transparent window on top. Push it gently in until you feel it lock.

NOTE: The training tape is supplied with the record tab removed to prevent accidental erasure of its content, but there is a tab on the blank tape. You should develop the habit of checking the tab whenever you use any tape.

2. Operate the PROGRAM key.

3. Operate the LOAD PROGram key to the right of the CAPTURE MEMORY zone. The microprocessor that controls the tape will automatically reposition the tape to the program area, read the program, and reposition the tape to block 000 for playback purposes.

Observe the display (Figure 2-4). The Test ID is "BSC Training Tape" followed by an issue number. The other parameters of this menu may be of interest; however, they will be discussed further in later sections.

4. Operate the MONITOR key. After the tape automatically positions itself, data is displayed. Observe that the top two lines indicate we are MONitoring the TAPE at BLOCK XXX as a source for signals on BOTH the DTE and DCE lines using EBCDIC, SYNC with 32_{16}, 32_{16} for synchronization characters.

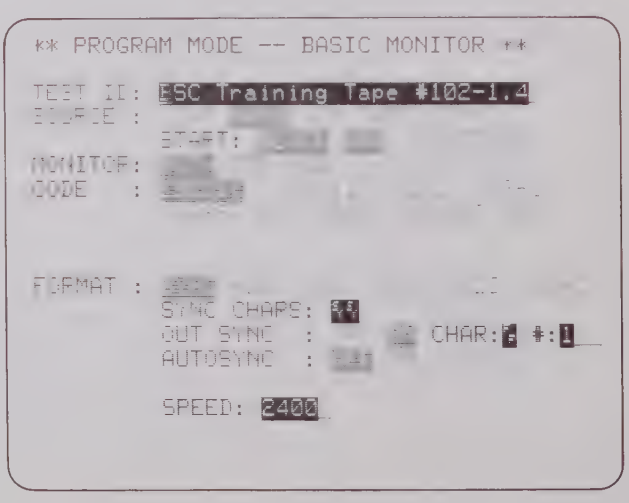

Figure 2-4

2.3 POWER-UP WITH TAPE INSERTED

Operate the PROGRAM key to stop the tape and power down the 3500. Leave the tape inserted.

CAUTION: Always operate the red PROGRAM key to stop the tape motion and then power down the 3500. Never eject a tape until after tape motion has stopped or you may damage the tape-drive mechanism.

1. Power up the 3500. The tape is automatically searched for a test program in its protected location after the internal self tests are complete. The program is automatically loaded and the power-up menu with the TEST ID displayed as shown in Figure 2-5.

```
        ** INTERVIEW 3500 **
RS-232 / V.24 INTERFACE
TAPE: BSC Training Tape #102-1.4
SELF TEST: GOOD


PRESS PROGRAM KEY FOR MENU PAGE
PRESS MONITOR KEY TO START PROGRAM

                SOFTWARE VERSION: 03.04
```

Figure 2-5

2. Operate the MONITOR key. Data from the tape is now displayed on the CRT (Figure 2-6).

2.4 REVIEW

To use a saved program tape that has already been inserted in the 3500, only two keys are required: Power-up and MONITOR.

To insert a saved program tape after power-up--

1. Insert the tape.
2. Operate the PROGRAM key.
3. Operate LOAD PROGram.
4. Operate MONITOR.

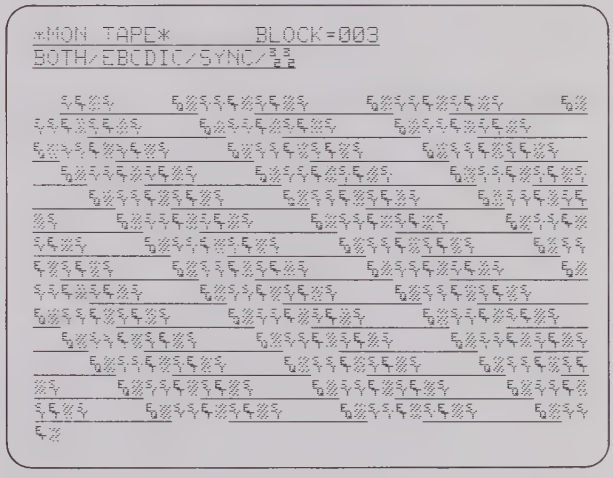

Figure 2-6

3 Monitor Mode

The BISYNC training tape contains data-simulating exchanges between a host computer and an IBM 3270 terminal. The techniques used to monitor the data on the tape can easily be extended to field applications, including multi-drop configurations. For more in-depth information on BISYNC the reader should consult IBM documents such as GA27-3093.

The BISYNC training tape can be used in the 3500 off line as a self-teaching aid for 3500 operation as well as an aid in learning the basics of BISYNC protocol.

By programming the 3500, the operator can perform extensive diagnostics on the data. These programs can be saved on additional tapes for future use in on-line applications.

A few examples of the diagnostic applications the user can perform after using this manual follow.

Display:

- Suppress all idle pad (FF) characters to increase the efficiency of the display.
- Enhance specific protocol characters.
- Display only protocol characters and suppress all text.
- Display only text and suppress all protocol characters.
- Display only message blocks and suppress all other transmissions.
- Display only messages from a given address.

Count:

- All polls, or polls to a specific address.
- All messages, or messages to a specific address.
- Data characters, or protocol characters.
- Characters in a message, individually or cumulatively.
- Idle characters.
- Responses, e.g., ACK, NAK, WACK.
- Alarms on specific criteria, e.g., NAK, WACK.

Time measurements:

- Interface response, RTS-CTS.
- Response to poll.
- Message reply.
- Duration of messages.
- Duration of idle.
- Data-to-interface and interface-to-data delays.

3.1 DATA, REAL TIME

Operate the HEX key and observe that the entire display is hexadecimal

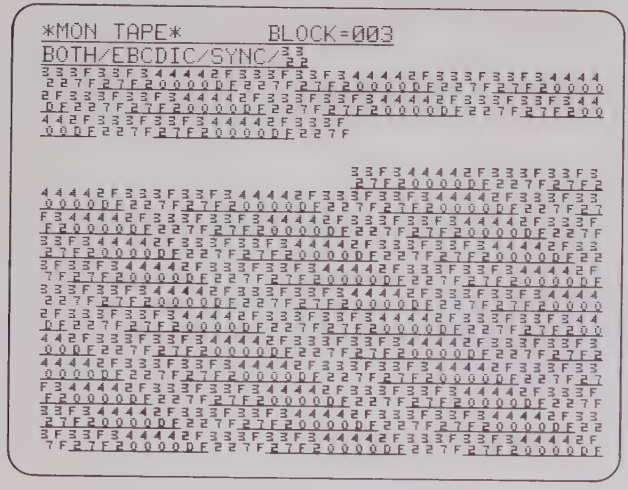

Figure 3-1

(except the status lines), as shown in Figure 3-1. Operate the HEX key again to restore text.

Operate CONTROL plus HEX and observe that only the control (protocol) characters change to hexadecimal and the text remains (as in Figure 3-2). This is extremely valuable in debugging software problems. Operate CONTROL plus HEX again to restore all text.

HEX and CONTROL plus HEX are alternate-action operations.

Notice that in the training tape program each STX, ETX, or DLE character is reverse-image enhanced. Up to eight characters can be enhanced. This feature aids in picking out specific character situations on the CRT.

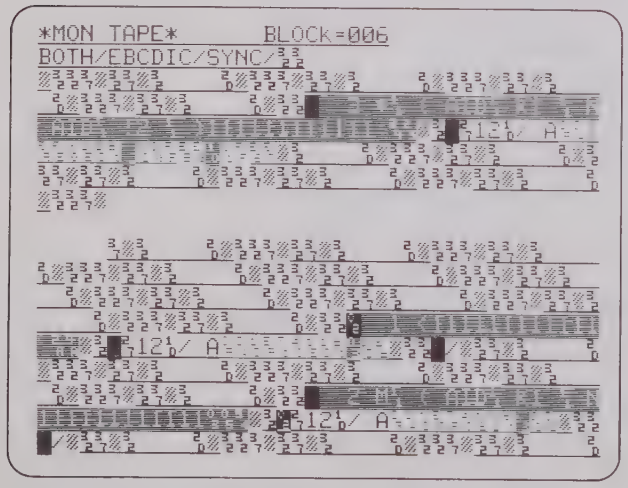

Figure 3-2

DCE data is underlined because the DCE is usually connected to a transmission line!

The CRT highlights Reverse, Low, Blink, and HEX may be observed. These are programmed in the training tape.

The program also announces NAKs with an audible alarm.

Speed of the CRT display is 2400 bps as defined by the program on the training tape. To speed up the display, operate the UP cursor key. In Monitor mode, each operation of the UP cursor key doubles the playback speed to a maximum of 9.6 kbps. (The tape will record data at 19.2 kbps.) Each operation of the DOWN cursor halves the playback speed.

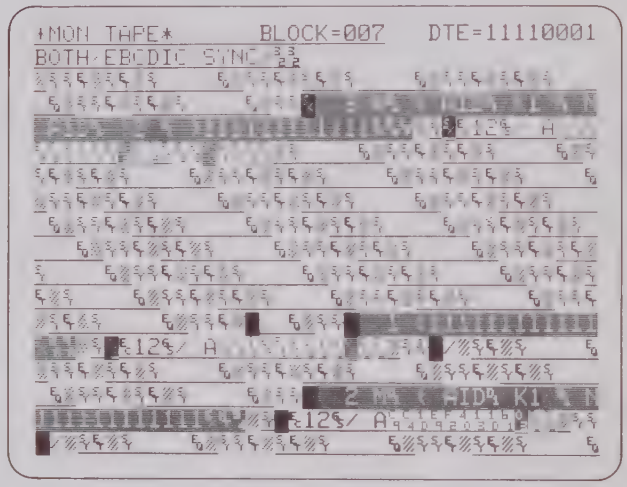

Figure 3-3

NOTE: There are pauses in writing to the display because the training tape is programmed not to display more than one IDLE PAD FF_{16}.

3.2 DATA, FREEZE

Operate the MANUAL FREEZE key in the CRT control zone to obtain a display similar to Figure 3-3.

Notice that the two lines that were blanked when the display was running real time have restored their data to display a full 640 characters. The oldest character blinks (the enhanced characters also continue to blink).

Operate the B key to display the Beginning of the buffer (Figure 3-4 is typical) and then the E key for the End of the buffer (Figure 3-5 is typical). Intermediate positioning of the 640 character CRT window in the 1920-character buffer is accomplished by pressing the UP or DOWN cursor key until, after the cursor reaches the top or bottom of the CRT, the next line is pulled onto the screen.

Notice that the RIGHT and LEFT cursor keys also position the cursor (blinking character) and it "wraps" around from the end (or beginning) of one line to the beginning (or end) of the next. This is a valuable time-saving feature.

The right side of the top two lines displays DCE or DTE plus a 1-0 pattern representing the binary pattern of the character at the cursor position. Bit 1 (low-order bit), the first bit in the serial stream, is on the right. This permits the hexadecimal equivalent to be read from the bit pattern directly.

NOTE: We have observed this convention throughout the 3500 display and documentation. This is an important point as there is much inconsistency in the industry's literature.

Observe that the MANUAL and FREEZE LEDs on the panel are ON.

Also notice that the block number of the tape remains displayed.

In playback mode only, the tape stops when MANUAL FREEZE of the CRT is operated. MANUAL STOP of the CAPTURE MEMORY will stop the tape also and thus freeze the display in the same manner.

HEX and CONTROL plus HEX also work in Freeze.

Operate CLEAR CRT in the CRT CONTROL zone to clear the display of old data. (The buffer is also cleared).

Operate RESUME TRIGGER to again display real-time data.

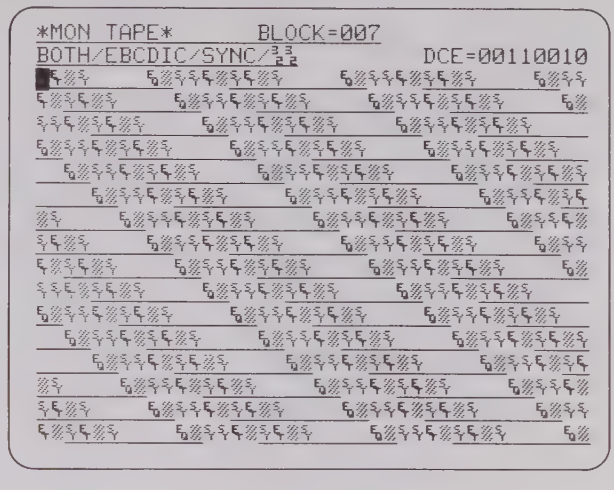

Figure 3-4

3.3 RESULTS, REAL TIME

Operate PROGRAM, then MONITOR, to initialize the tape to block 000. With data being displayed operate the RESULTS key in the DISPLAY zone.

Observe that the two top status lines remain and the tape block is still counting.

Observe that the four counters and two timers are clearly named to show their functions in this program. The poll counter will be actively counting and the other counters may also, depending on what data is read from the current block of the tape.

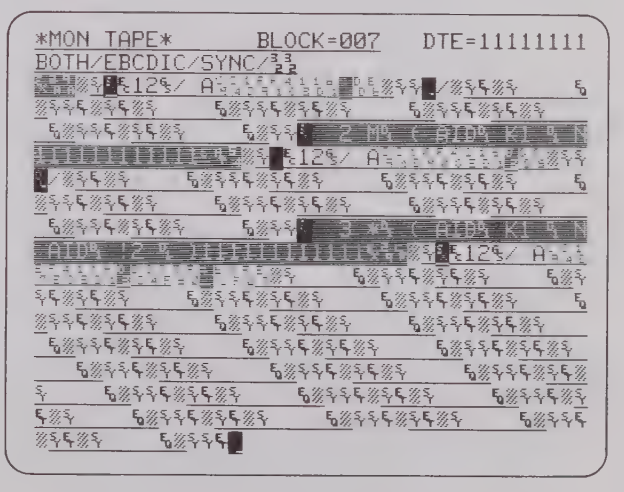

Figure 3-5

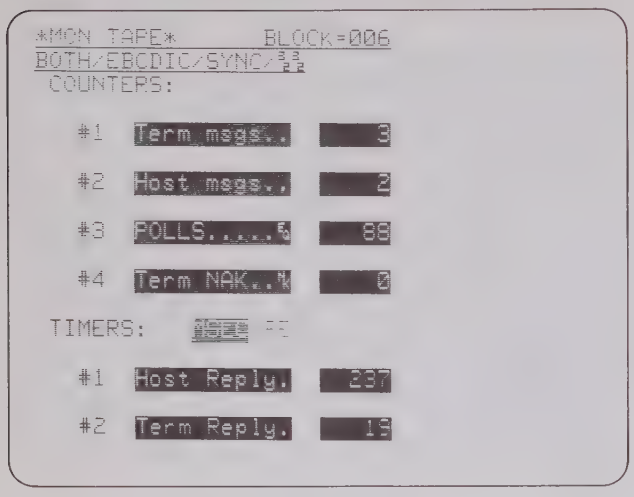

Figure 3-6

Operate the DATA key and notice that data is still being monitored.

Return to RESULTS.

Notice the value of the poll counter; operate the C key and then the 3 key to reset Counter 3 to zero. Any counter can be reset with C followed by the number or any timer by T followed by the number. The R key resets all counters and timers. Operate MANUAL FREEZE and observe that the counter accumulation stops because the tape stops.

Press RESUME TRIGGER and observe that the counters and timers resume counting, without resetting.

Results can be easily modified while a test is running to enable the operator to look for several criteria at the same time without going back into the Program Mode.

Both timers increment in milliseconds or seconds as shown on the display (Figure 3-6).

Maximum count is 65,535 for counters and timers. "Overflow" is so indicated.

NOTE: All data received by the 3500 is presented to the counters and timers whether or not the data or portions of it are displayed on the CRT or recorded onto tape.

3.4 PROGRAM SUMMARY

After viewing the data and the results, the operator often desires to review the program.

3.4.1 What, for example, is causing the Terminal Messages counter to increment? Display RESULTS to verify that Counter 1 is counting terminal messages.

Operate PROGRAM SUMMARY in the DISPLAY zone and look for CTR1. As in Figure 3-7, the Trigger #1 line shows that an STX from a DTE source causes Counter 1 to increment (I).

3.4.2 Display RESULTS and notice that Timer 1 is measuring Host Reply time.

Display the Program Summary (Figure 3-7) again and observe from the Trigger #2 line that TMR1 restarts (R) upon an ETX from a DTE source. Two Don't Care, DC, characters are added in order to allow for the two CRC bytes that follow the ETX. The timer will restart when this 3-character string has been received. On the Trigger #3

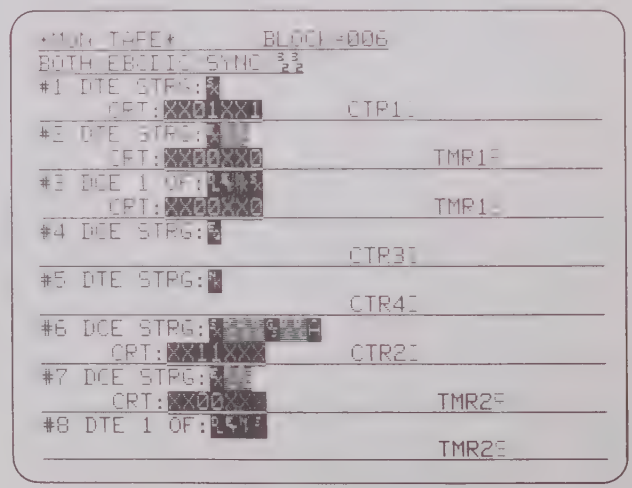

Figure 3-7

line, see that TMR1 will stop (S) upon DLE, EOT, NAK, or STX from a DCE source.

NOTE: Triggers are discussed in detail in Section 5.

3.4.3 Return to Results and observe that the counters, timers, and block numbers have changed because the monitor program has been running while we have been observing the Program Summary.

3.5 MONITOR REVIEW

In MONITOR mode, without stopping the test or interrupting the recording of data onto tape, the operator may review the Program Summary or Results, reset the counters or timers or both, and manually freeze or unfreeze the display and return the CRT to TRIGGER control. This capability substantially increases efficiency, especially in time-critical situations.

4 Applications: Program Editing

4.1 GENERAL MONITOR

The program on the training tape may be considered a general monitor.

4.1.1 Figure 4-1 (Display) shows the data highlights included in the program to distinguish the essential protocol ingredients.

- Messages from the DTE are reverse low intensity.
- Certain portions of messages are displayed in hexadecimal. In Figure 3-7, the Program Summary, notice the pattern XX11XXX under Trigger #6 and XX00XXX under Trigger #7. Comparing these patterns with the SET CRT selections in Figure 4-2, a trigger menu, we can see that Trigger #6 is set to display the characters following a specified 8-character string in LOw-intensity HEXadecimal. Trigger #7 turns low-intensity hexadecimal off following a 3-character string (end of block).
- STX, ETX, and DLE blink whether displayed in hexadecimal or text, to identify message blocks and ACKS.
- DCE data communication line data is underlined.
- One PAD character is shown; all others are suppressed. The operator can easily detect the pauses in the display during the suppressed-pad time.

4.1.2 Figure 3-6 (Results) shows the actual circuit utilization. These counters and timers continue operation

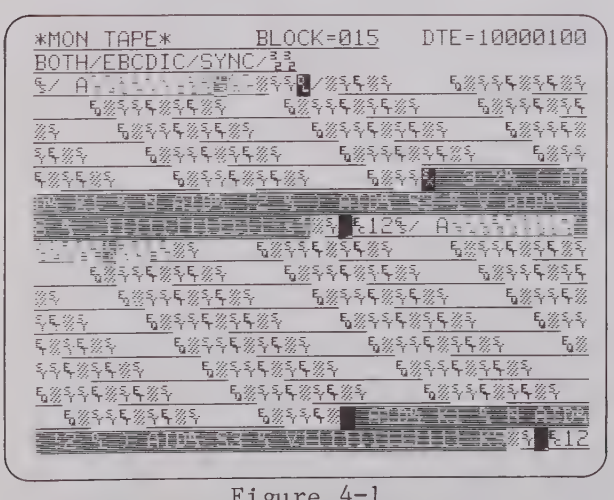

Figure 4-1

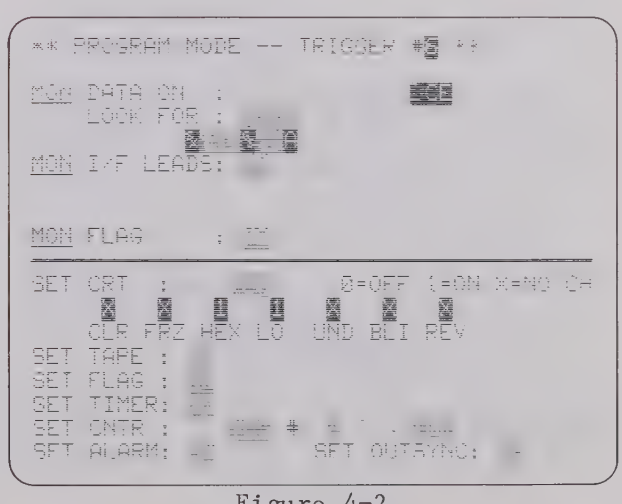

Figure 4-2

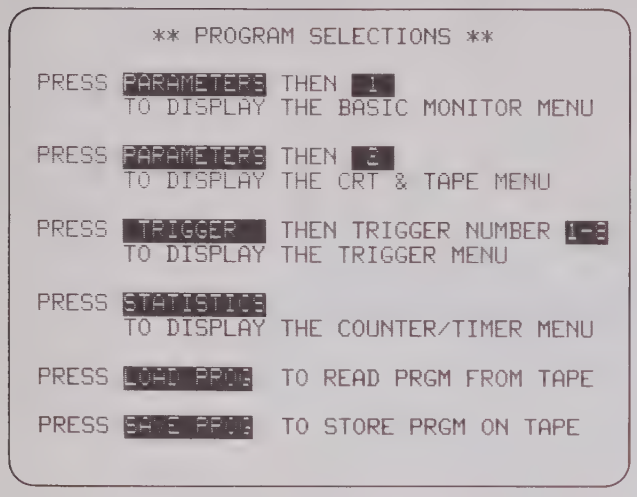
** PROGRAM SELECTIONS **
PRESS PARAMETERS THEN 1
TO DISPLAY THE BASIC MONITOR MENU
PRESS PARAMETERS THEN 2
TO DISPLAY THE CRT & TAPE MENU
PRESS TRIGGER THEN TRIGGER NUMBER 1-3
TO DISPLAY THE TRIGGER MENU
PRESS STATISTICS
TO DISPLAY THE COUNTER/TIMER MENU
PRESS LOAD PROG TO READ PRGM FROM TAPE
PRESS SAVE PROG TO STORE PRGM ON TAPE

Figure 4-3

while data is displayed on the CRT. Freezing the CRT does not stop the counters and timers when data is from the line. When the data source is tape, FREEZE stops the tape and counters and timers too. Using the HALT key will suspend all 3500 monitor operation until the MONITOR key is again operated. The first operation of the MONITOR key does not reset counter values after a Halt.

4.1.3 Comments on the data of this training tape as analyzed by the 3500:

• The use of many SBA instructions instead of numerous space or null characters provides good message efficiency.

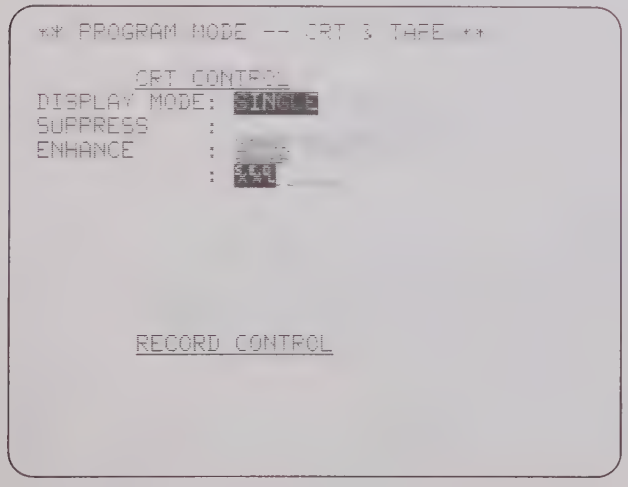

Figure 4-4

• Host and terminal response time is good.

• An EOT reset is sent prior to each poll, whereas some networks only send an EOT reset prior to the poll of the first station on the poll list.

4.2 SELECTIVE DISPLAY

Often the operator needs only the protocol sequence or only the data. The 3500 allows him to easily suppress the nonrelated information, thereby obtaining a greatly condensed and more easily used display.

You will now perform the first Program editing action.

1. Load the training tape program and operate the PROGRAM key to obtain Figure 4-3.

2. Notice the second selection on the menu relates to CRT and TAPE control.

3. Operate PARAMETERS and then the 2 key to obtain Figure 4-4.

Only five keys are required to manipulate most menus on the 3500:

• The ENTER key always moves the cursor selection to the next field--that is, the next group of selections--whether down or to the right.

• The four cursor keys move the cursor to the next cursor position: the UP or DOWN arrow usually moves the cursor to the previous or next field. The LEFT and RIGHT arrows move the cursor horizontally to make parameter selections.

ENTER should be used to move to the next field: using the cursor key may alter your selections.

The previously selected parameters on the menu are shown in low-intensity reverse image. The cursor is at the blinking bright reverse selection.

When the cursor is on a selection, that selection is entered in the program.

Obtain SUPPRESS by using the ENTER key to move the cursor down to the SUPPRESS line. If you go down too many

lines use the UP cursor arrow to reposition the cursor on the SUPPRESS line.

Up to eight characters may be entered; however, there are more than eight protocol characters! In EBCDIC all (and only) protocol control characters have bit 8 and bit 7 as logic 0; therefore, we can suppress all of the control characters if we suppress all characters with bits 7 and 8 equal 0.

Operate the BIT MASK key located on the lower left of the keyboard and observe that an eight-bit mask of XXXX XXXX is displayed. The cursor is at bit 8 (high-order bit is on the left). Press the number 0 key twice to enter 0

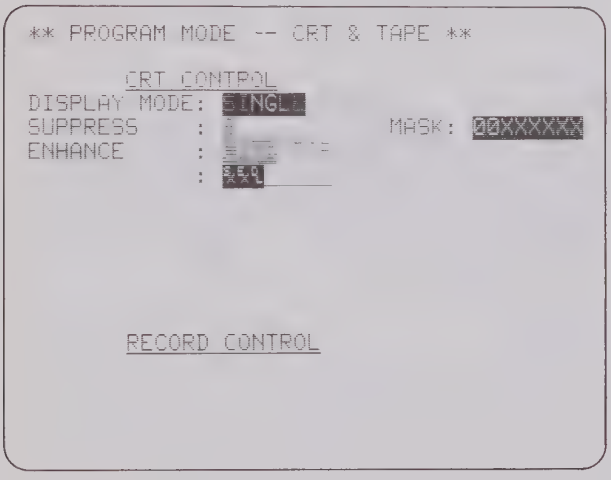

Figure 4-5

for bits 8 and 7. The pattern is now 00XX XXXX, where the X's mean "Don't Care." (See Figure 4-5.)

Operate MONITOR; notice that all protocol characters are suppressed as in Figure 4-6 and it only required a total of six key strokes! And the Results display is still fully operational.

> Note: Only one bit mask at a time may be entered on this menu.

Text can be suppressed instead of protocol characters if we suppress all characters where bits 7 and 8 are NOT EQUAL 0; in other words, by replacing the present bit mask with a not equal bit mask. Operate PROGRAM and display

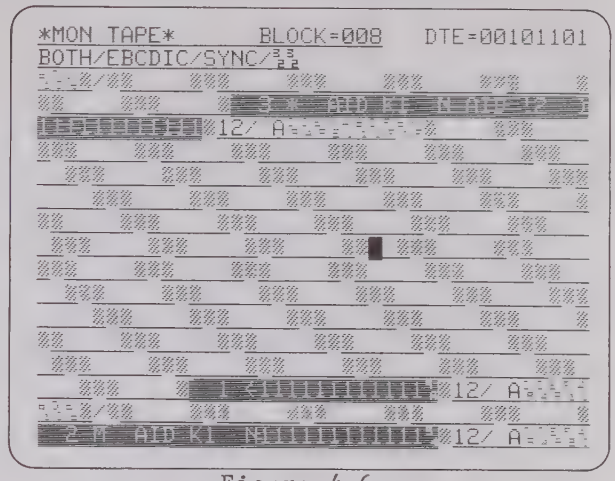

Figure 4-6

the Parameters 2 menu; using ENTER, tab down to SUPPRESS.

Notice the low-intensity M at the cursor position. Low intensity signifies that a symbol does not represent an alphanumeric character. In this case, M stands for bit mask, indicating that bit mask has been selected.

1. Operate the NOT EQUAL key. Notice the horizontal strike at the cursor position.

2. Operate BIT MASK and observe that a horizontal strike through low-intensity M indicates that all characters not equal to the bit mask M will be suppressed.

3. The 00XX XXXX pattern has not changed.

4. Operate MONITOR. The text is suppressed (Figure 4-7). Observe the

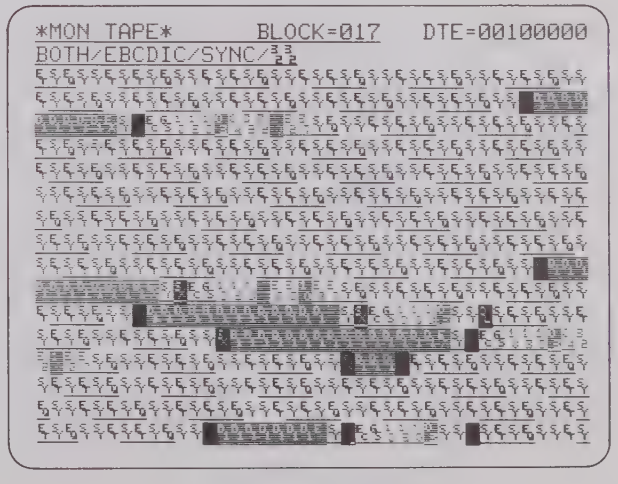

Figure 4-7

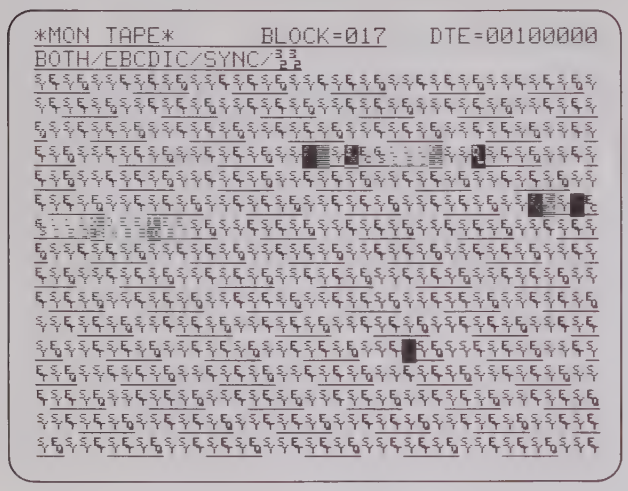

Figure 4-8

strings of DC1 characters (D1) on the tape (as in Figure 4-7). These can be suppressed to further condense the display. Select the Parameters 2 menu and tab down to the SUPPRESS line.

1. Position the cursor to the next character position to the right of the "not equal" bit mask (M).
2. Operate CONTROL plus DC1.
3. D1 will appear in addition to the bit mask (M).
4. Operate MONITOR.
5. Observe the display through tape block 17: DC1 characters are now suppressed as in Figure 4-8.

NOTE: Six more characters could still be added to the SUPPRESS list!

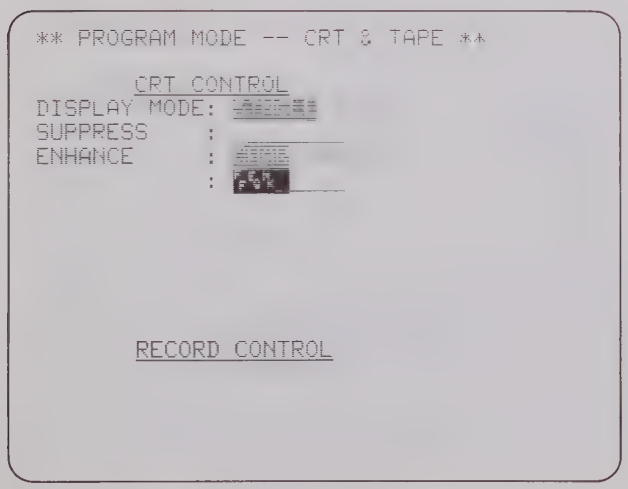

Figure 4-9

The SUPPRESS can be deleted as follows:

1. Return to Parameters 2. (Remember that you must first enter PROGRAM mode.)
2. Position the cursor on the SUPPRESS line.
3. Operate the CLEAR FIELD key (near the cursor keys).
4. Observe that the selections are cleared.

4.3 SELECTIVE ENHANCEMENT

The ability to ENHANCE specific characters is a valuable diagnostic

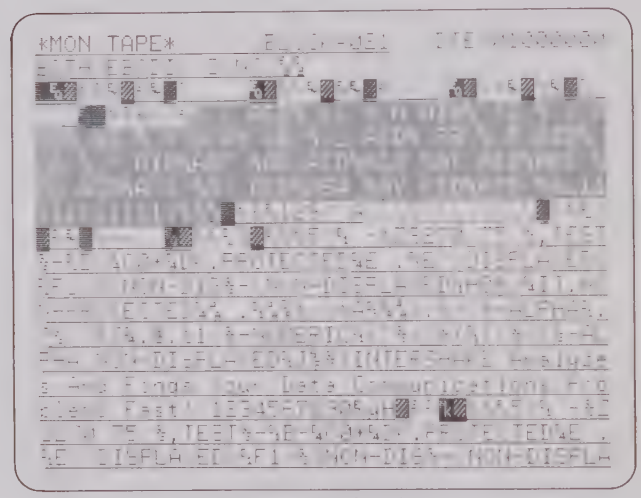

Figure 4-10

aid. The selected characters blink in reverse image to alert the operator to their occurrence.

1. Load the training tape program.

2. On the Parameters 2 menu place the cursor on the line following ENHANCE.

3. The training tape program is shown to enhance STX, ETX, and DLE.

4. Operate the CLEAR FIELD key.

5. Enter FF_{16} by using the HEX key followed by F and F to highlight idle pad characters.

6. Enter ENQ (CONTROL plus E) and NAK (CONTROL plus U) (Figure 4-9). You may enter any other five characters desired.

7. Operate MONITOR and notice that the selected characters blink. (In Figure 4-10, the blinking characters appear as blurred reverse image.)

8. Return to the Parameters 2 menu and clear the ENHANCE field.

4.4 MESSAGE ONLY DISPLAY

During the development of application programs for a host computer, the

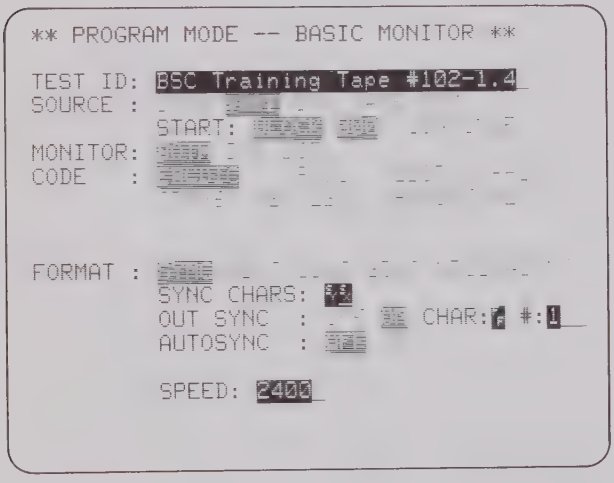

Figure 4-11

operator may be primarily interested in text messages and desire to delete any protocol display.

The operator can cause the 3500 to accept any two characters as SYNC characters. If he selects SYN and STX, synchronization will only occur when a message is received beginning with STX.

1. Load the training tape program.

2. Select the Parameters 1 menu.

3. Using ENTER, tab down to the SYNC CHARS line and enter SYN (CONTROL

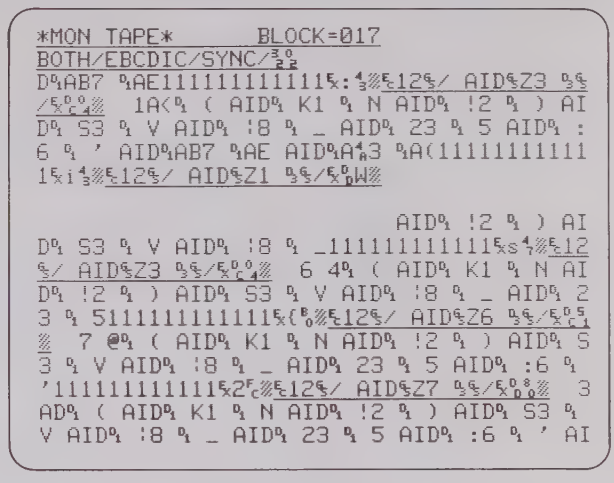

Figure 4-12

plus V) and STX (CONTROL plus B) (see Figure 4-11).

4. Operate MONITOR and observe that since only messages are presented, the first few blocks of the tape are not displayed at all, and then numerous blocks are condensed into one display (Figure 4-12).

5. Select the Parameters 2 menu and ENHANCE ETX and ETB to clearly mark the end of each message!

6. Observe that the messages in the compact display are easily distinguished by the ending ETB or ETX (Figure 4-13).

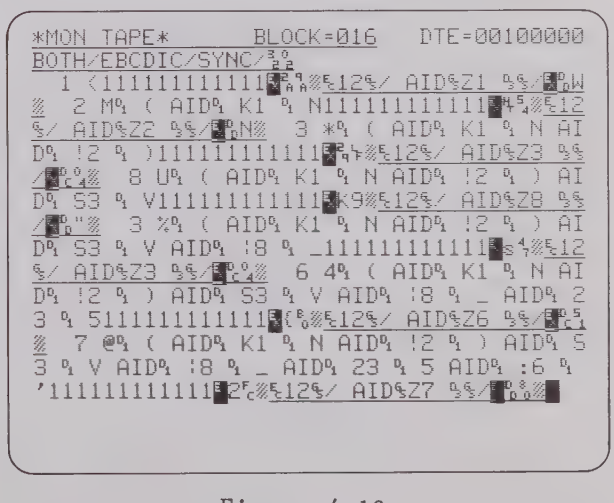

Figure 4-13

7. Select the Parameters 2 menu and SUPPRESS SPACE (use space bar) and DC1 characters as in Figure 4-14.

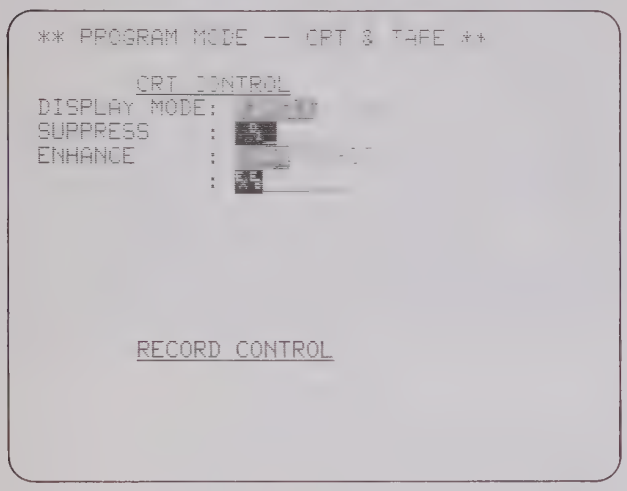

Figure 4-14

8. MONITOR to obtain the condensed display of Figure 4-15.

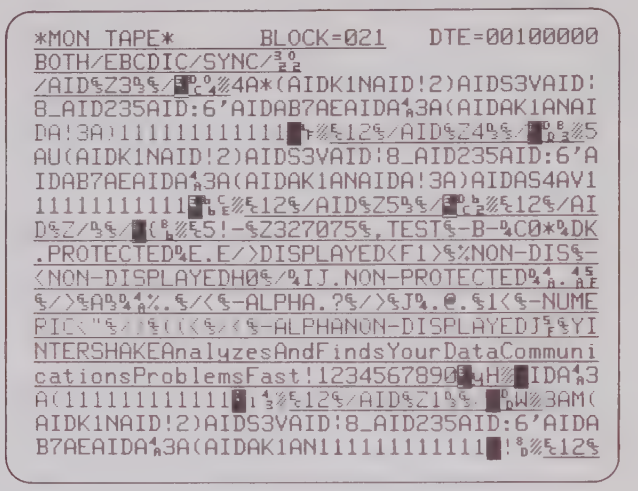

Figure 4-15

5 Multi-Drop System Analysis

5.1 TERMINAL ACTIVITY

Since the data on the BISYNC training tape was not taken from a multi-drop line, the program we are about to develop cannot be used to monitor the data on the training tape. However, the skills needed to compare terminals in a multi-drop system can easily be acquired from this tape, and the user can then apply the program developed to his line data.

Often a particular terminal or a few terminals on a drop will experience a longer queue delay than desired. The first step is to determine whether that terminal is receiving an appropriate number of polls. Some host software provides for dynamic poll adjustment to increase the number of polls to more active terminals.

Each of the four counters can be easily assigned to a specific poll address.

5.1.1 Default Program. The program to monitor terminal activity will be developed from the power-up default-to-BISYNC program of the 3500. The training tape will be used only as a data source.

1. Remove the training tape.

2. Power up the 3500.

3. Select the Parameters 1 menu.

4. Position the cursor to SOURCE and select TAPE (Figure 5-1).

5. Insert the training tape and operate MONITOR.

6. Observe that data is displayed without any enhancements.

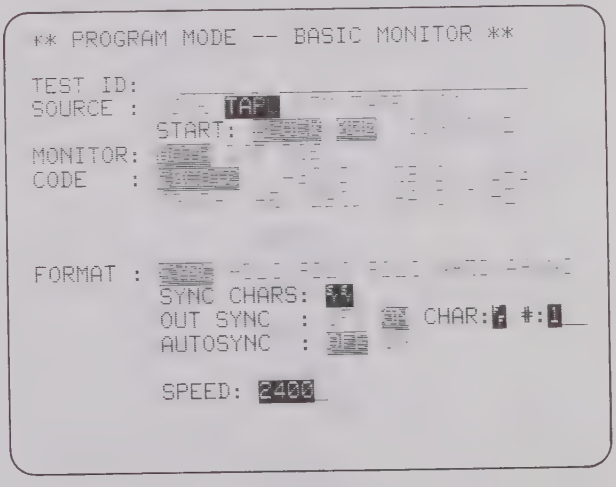

Figure 5-1

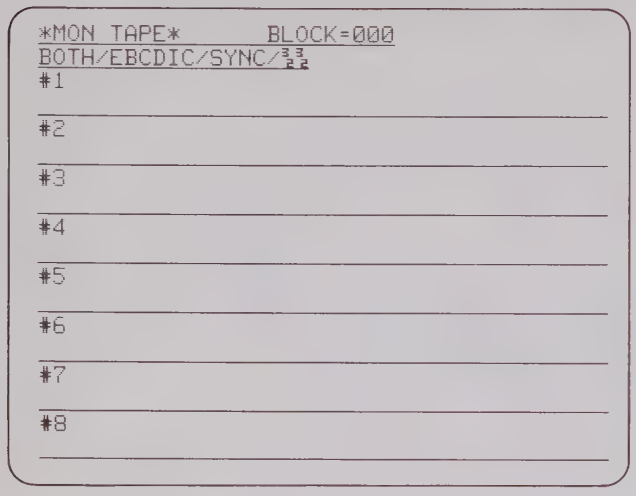

Figure 5-2

The Program Summary and Results displays are empty, as shown in Figures 5-2 and 5-3.

Now let's make a program to count polls to the terminal on the training tape.

1. Operate PROGRAM.
2. Operate TRIGGER and notice that this display is identical to the Program Summary display (Figure 5-2) in the Monitor mode! There are eight trigger lines.
3. Operate the numeral 1 key to display Figure 5-4, the menu for Trigger #1.

5.1.2 Trigger Menu. There are eight Trigger menus. All are active at the same time and are independent of one another.

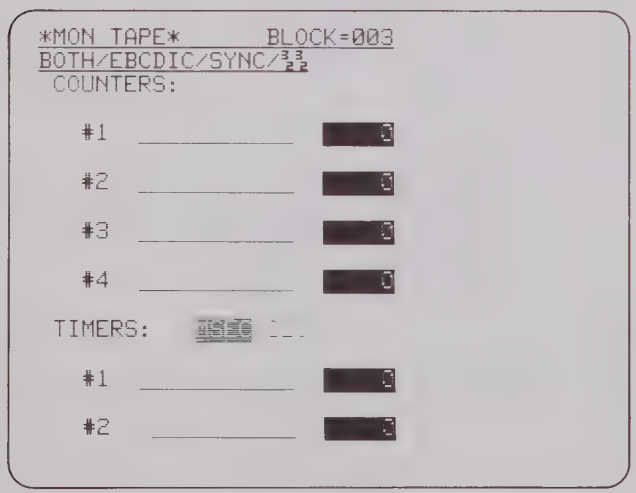

Figure 5-3

Notice that the horizontal line divides the top MONitor characteristics that the trigger is looking for from the bottom SET actions that the trigger will take.

There are three monitor conditions the 3500 trigger will look for:

1. Data Characters.
2. Interface Lead Status.
3. Internal Flags.

Each trigger may look for DATA on NEITHER circuit (no data search) or on the DCE or DTE circuit. Since the polls on the tape are coming through the DCE, the SOURCE is DCE.

1. Position the cursor to DCE and observe that additional criteria

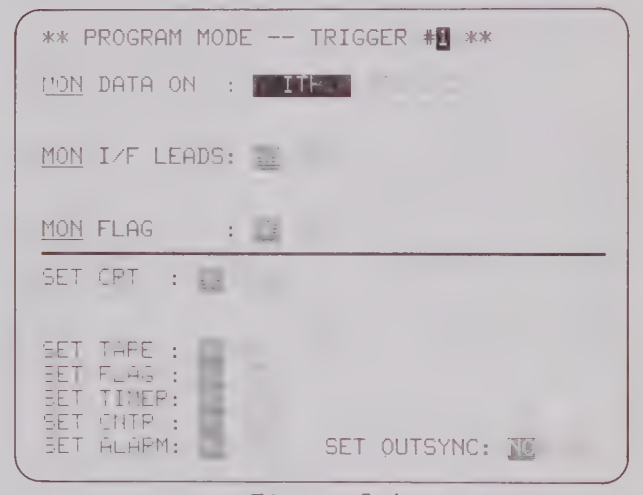

Figure 5-4

appear. Since a character STRING is most often used, the selection defaults to STRG. A character string of SPACE ENQ defines the polls to the terminal on the training tape.

2. Position the cursor down to the character entry line (line below LOOK FOR).
3. Enter SPACE (using the space bar) and ENQ (CONTROL plus E). (Up to eight characters could have been entered.)
4. Move the cursor to CNTR in the actions half of the menu and indicate YES, whereupon the counter number and counter action are displayed, as in Figure 5-5.
5. Counters default to Counter 1 and INCrement so no entry by the

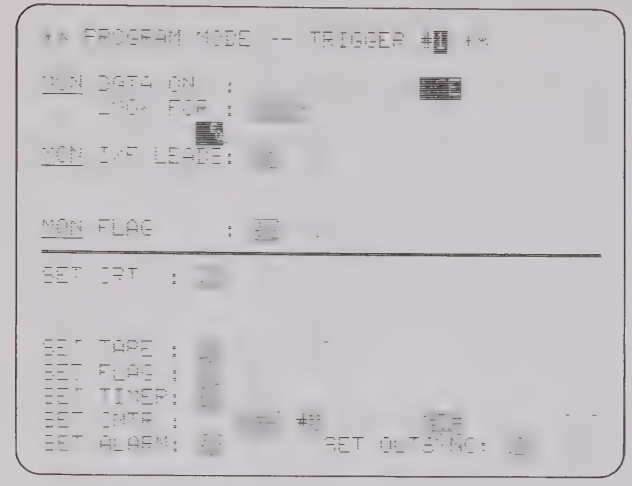

Figure 5-5

operator is required for the first counter selection.

Operate the TRIGGER key, and observe that a summary is presented (see Figure 5-6). Notice that the source, DCE: space, ENQ, is on the top line and the action set is on the second line, thus maintaining the split display of the trigger menu itself.

5.1.3 Statistics Menu. Each counter should be given a name to make the Results easier to interpret. These names can be entered on the Statistics menu.

1. Operate the STATISTICS key.
2. The cursor defaults to Counter 1.
3. Type in a name for Counter 1.

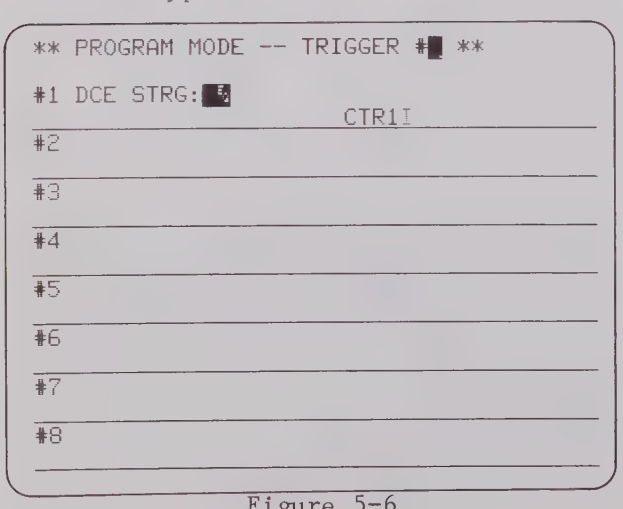

Figure 5-6

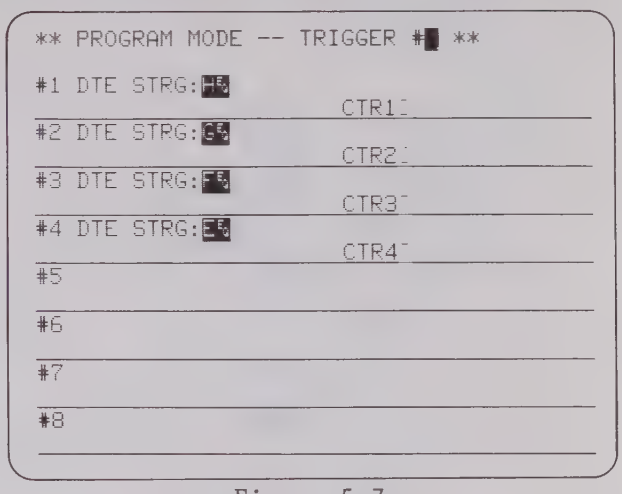

Figure 5-7

NOTE: Control characters can be used. HEX is not permitted.

5.1.4 Multi-Drop Example. If you were monitoring data from a multi-drop system, you could now set Triggers #2, #3, and #4 to count polls to three other terminals, using Counters 2, 3, and 4, respectively. The TRIGGER summary display of Figure 5-7 is an example. The Statistics display would then appear as in Figure 5-8.

5.1.5 Monitor. Operate MONITOR. Data is now displayed without the prior enhancements of the training tape program. Observe the Results for a few blocks.

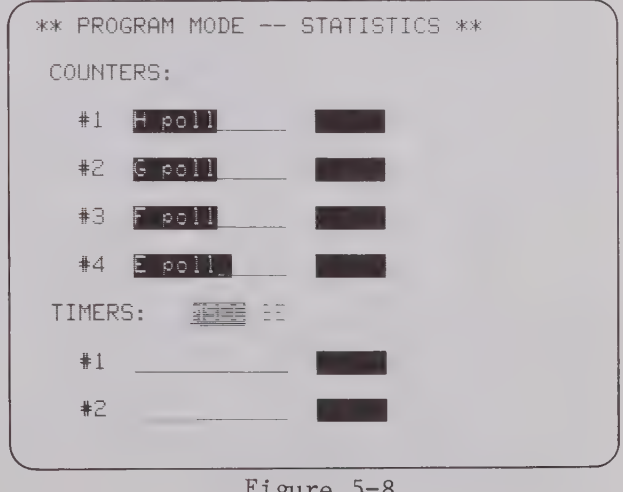

Figure 5-8

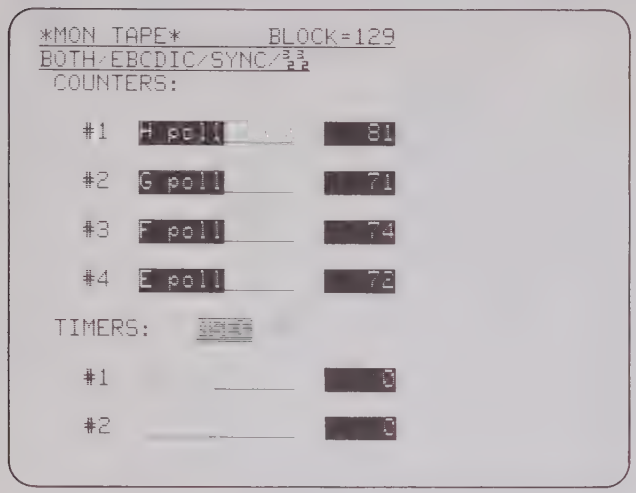

Figure 5-9

Figure 5-9 shows Results for the multi-drop example of Figure 5-7. Terminal H has more polls. The user would have to assess the impact of this variation in polls for his own system.

5.2 SELECTIVE DISPLAY OF ONE TERMINAL

Often a specific terminal appears to cause difficulty. This program permits the display of the response block from the terminal replying to a specific poll.

5.2.1 Use of Flags. Although the eight triggers are independent, they can be interrelated by using flags: there are eight flags that can be turned on or off by trigger actions; these flags can also be monitored as trigger inputs.

We shall turn ON a flag when the H poll occurs and turn that flag OFF for any other poll address. Therefore any STX received while the flag is on is from terminal H.

Trigger actions include the capability to freeze or unfreeze the display. The receipt of an STX while the flag is on will unfreeze the display. The receipt of an ETX can be used to freeze the display.

5.2.2 Clearing Triggers. LOAD the training tape program; then--

1. Display the TRIGGER summary.
2. Operate CONTROL plus CLEAR FIELD. This clears all triggers to default condition.
3. Display the STATISTICS menu and operate CONTROL plus CLEAR FIELD to erase the counter and timer names.

5.2.3 Setting Triggers. We shall now enter a selective display program for terminal H in the multi-drop example introduced in Section 5.1.4. Four triggers will be required.

1. Select the TRIGGER #1 menu and enter DTE string H ENQ (SHIFT plus H, CONTROL plus E).
2. Position the cursor to SET FLAG. Select YES; then use the ENTER key to get to the space for the flag number. Enter 1. The program defaults to ON.
3. Select the TRIGGER #2 menu and enter a two-character DTE STRG consisting of characters not equal to H followed by ENQ (NOT EQUAL, SHIFT plus H; then ENQ).
4. Position the cursor to SET FLAG and select YES; then use the ENTER key to get to the space for the flag number. Enter 1. Use the ENTER key, then the RIGHT cursor arrow to select OFF. This enables any character other than H followed by ENQ to turn Flag 1 OFF.
5. Select the TRIGGER #3 menu and enter DCE STRG:STX. Also select MON FLAG and enter Flag 1. The menu will

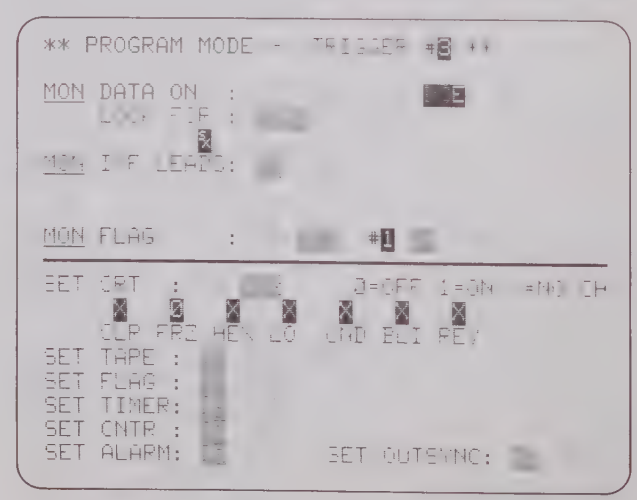

Figure 5-10

default to ON. Flag 1 must be ON when the STX string is received for the action of this trigger to be set.

6. Position the cursor to SET CRT and select YES. There will now be displayed seven CRT characteristics. Each characteristic can be controlled ON (1), OFF (0), or NO CHANGE (X). Since this trigger is to UNFREEZE the CRT, position the cursor to FRZ and enter a 0 to turn OFF the Freeze condition. The Trigger #3 menu should look like Figure 5-10.

7. Select the TRIGGER #4 menu and enter DCE STRG:ETX. Since the two CRC (BCC) characters may be of interest, add two DON'T CARE characters following ETX.

8. Position the cursor to SET CRT, YES; select FRZ on (1). The Trigger #4 menu should look like Figure 5-11.

9. Review the Trigger Summary and compare it with Figure 5-12. Retain the program for use in Section 5.3.

5.2.4 Monitor Mode. The operator is constantly and clearly informed of the condition and control of the display. He can use MANUAL UNFREEZE to override the program control to inspect all the data; then return to program control via RESUME TRIGGER without leaving the monitor mode.

In the Monitor mode, only messages from the H terminal are displayed. The

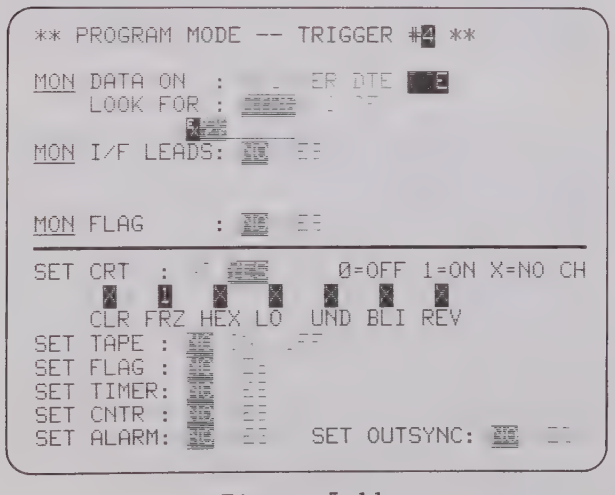

Figure 5-11

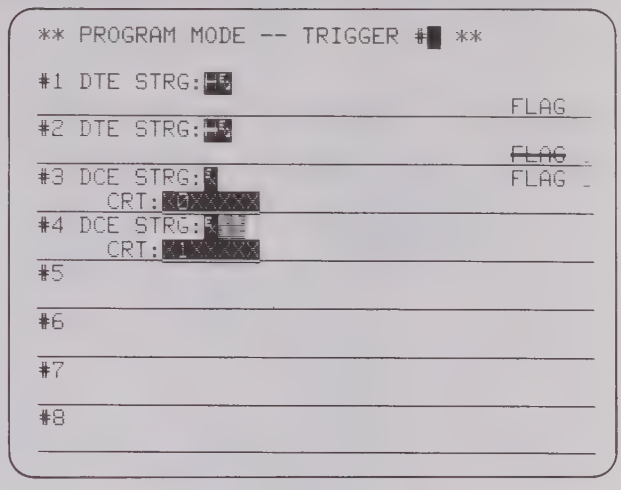

Figure 5-12

CRT CONTROL TRIGGER LED will be ON and the CRT FREEZE LED will blink ON when there is no data presented to the display.

To override the TRIGGER FREEZE and display all data, simply press MANUAL UNFREEZE. The CRT MANUAL LED will go ON, and the FREEZE LED OFF.

If the RESUME TRIGGER key is operated, the CRT will revert to the selective display program.

If counters have been gathering performance data, they will continue whether or not the data display is frozen.

Transmissions from the terminal that end with ETB will not freeze the CRT; therefore this program will display all multiple transactions (including intervening ACKS) until the ETX of the last block is transmitted.

The user can change the criteria to freeze the display in order to view more data. He can disable Freeze on Trigger #4 and enable freeze on Trigger #2. This will show all ACKS, NACKS, etc. for that transaction until the next poll.

5.3 PERFORMANCE MEASUREMENTS

An actual count of messages, characters, polls, and nonuseful characters is extremely valuable. We shall now build such a program on the basis of

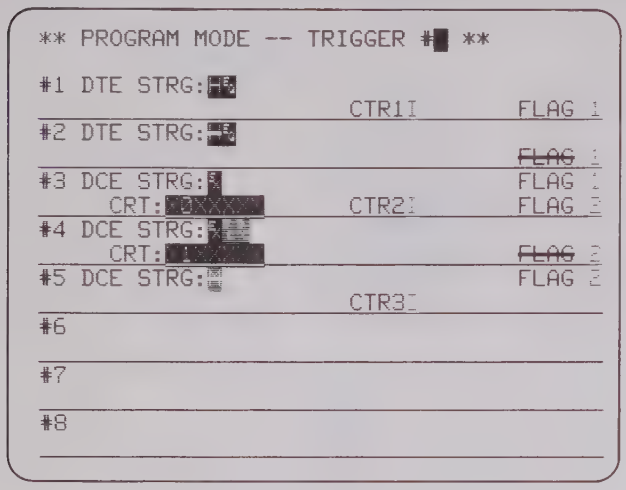

Figure 5-13

the selective display program in Section 5.2.

5.3.1 Selective Poll Counter. Using the Trigger #1 menu, set Counter 1 to INCrement to count each H poll.

Enter "H poll" as the name of Counter 1 on the Statistics menu.

5.3.2 Message Count. Using the Trigger #3 menu, set Counter 2 to INCrement to count each message coming from terminal H.

Enter "H msgs" as the name of Counter 2 on the Statistics menu.

5.3.3 Text Character Count. The number of text characters from H terminal can be counted by using Flag 2 to indicate the duration between STX and ETX from terminal H.

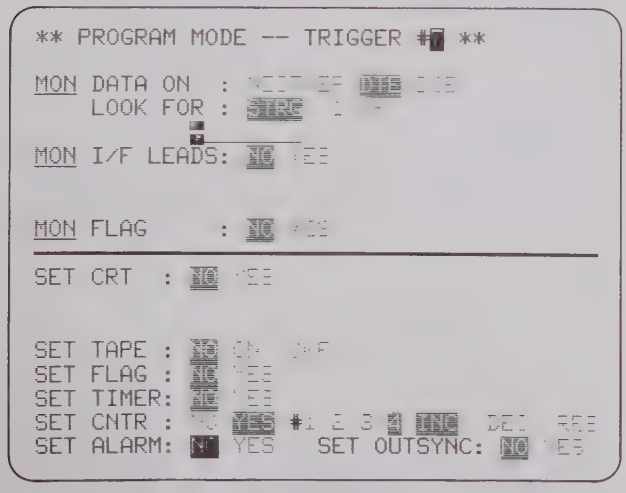

Figure 5-14

1. On the Trigger #3 menu, set Flag 2 ON.
2. On the Trigger #4 menu, set Flag 2 OFF.
3. Using Trigger #5, select MON DCE STRG, NOT EQUAL, BIT MASK, with bits 8, 7 equal to 0 for noncontrol character selection (as was done in Section 4.2). Also, select MON FLAG #2 ON.
4. Now set Counter 3 to INCrement. This will count all noncontrol characters (e.g., text characters) from terminal H. Figure 5-13 shows the Trigger Summary thus far.

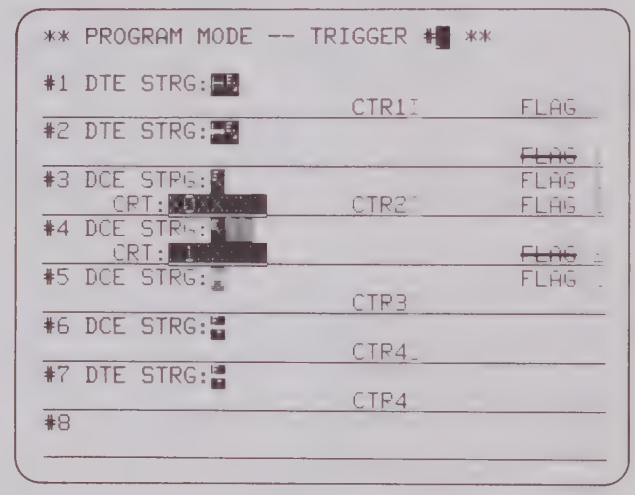

Figure 5-15

5. Enter "H TEXT CHRS" as the name of Counter 3 on the Statistics menu.

5.3.4 Total Character Count. Counting all nonpad (not equal to FF_{16}) characters on the DCE and DTE paths gives the total character count.

1. On the Trigger #6 menu select DCE STRG: NOT EQUAL, HEX, FF.
2. Now set Counter 4 to INCrement.
3. On the Trigger #7 menu select DTE STRG: NOT EQUAL, HEX, FF.
4. Now set Counter 4 to INCrement as shown in Figure 5-14.

5. Enter "TOTAL CHRS" as the name of Counter 4 on the Statistics menu.

Notice that two (or more) triggers can set the same action (in this example, Counter 4). This greatly increases the power and simplicity of programs.

5.3.5 Now compare the Trigger Summary display with Figure 5-15; and the Statistics display with Figure 5-16.

In monitor mode, each counter will indicate the activity on the circuit, as shown in Figure 5-17.

5.3.6 The address of the selected terminal can be modified on the Trigger #1

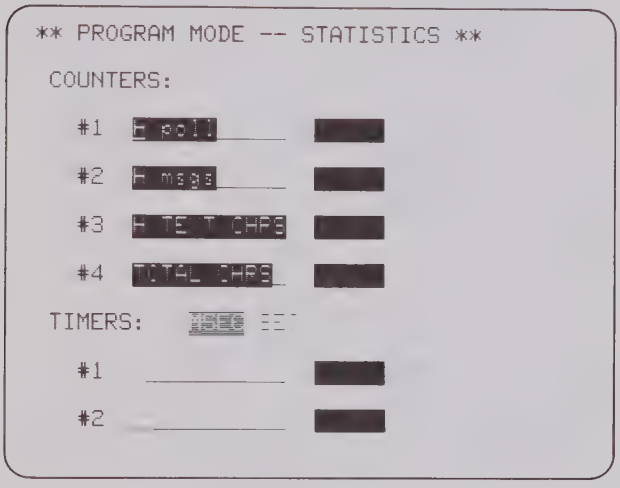

Figure 5-16

and #2 menus to reflect any device-controller combination, as up to 8 characters are included in the string.

5.4 RESPONSE TIME

5.4.1 Response Time of a Selected Terminal. Selected-terminal response time is measured by adding to the program of Section 5.3. The H poll will start the timer and the STX reply will stop the timer.

1. On the Trigger #1 menu, set Timer 1 to restart.
2. On the Trigger #3 menu, set Timer 1 to stop.

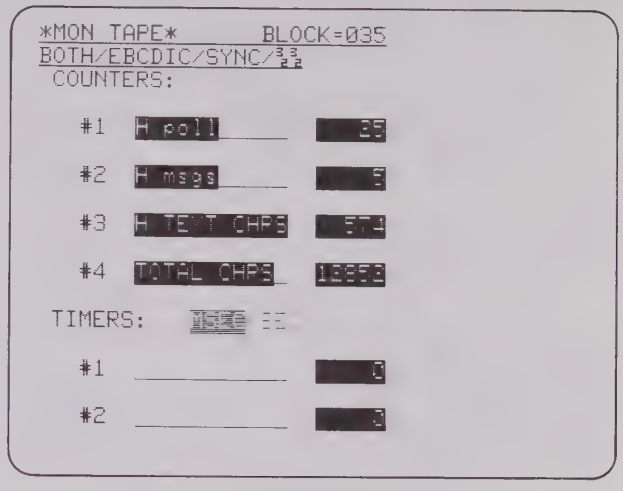

Figure 5-17

3. Name Timer 1 "H TERM RESP" on the Statistics menu. Figure 5-18 shows the Trigger Summary.

In monitor mode, RESULTS will display the various response times. While the timer continues to run there is no message response. When the timer stops, STX has been received.

5.4.2 General Response Time. General response time can be measured using the program of Section 5.4.1 and adding Timer 2.

1. On the Trigger #2 menu, set Timer 2 to restart.
2. On the Trigger #8 menu, select DCE source and LOOK FOR 1 OF STX, SOH,

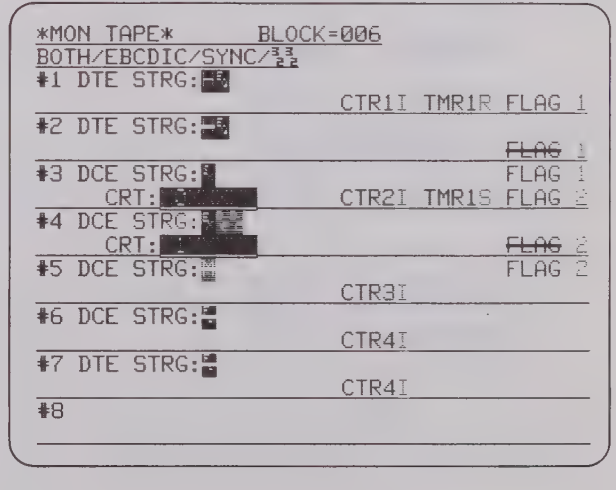

Figure 5-18

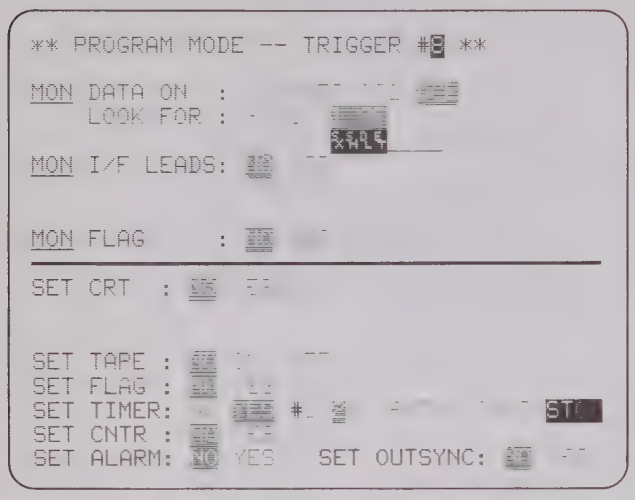

Figure 5-19

DLE, EOT; then set Timer 2 to stop (as shown in Figure 5-19).

3. Name Timer 2 "OTHER REPLY" on the Statistics menu. The variation in response time between Terminal H and the other terminals is shown in Figure 5-20. The trigger summary is shown in Figure 5-21.

To save this program, see Section 6.

5.5 SIMULTANEOUS FDX TRANSMISSION

In special BISYNC cases simultaneous transmissions from the DTE and DCE may occur.

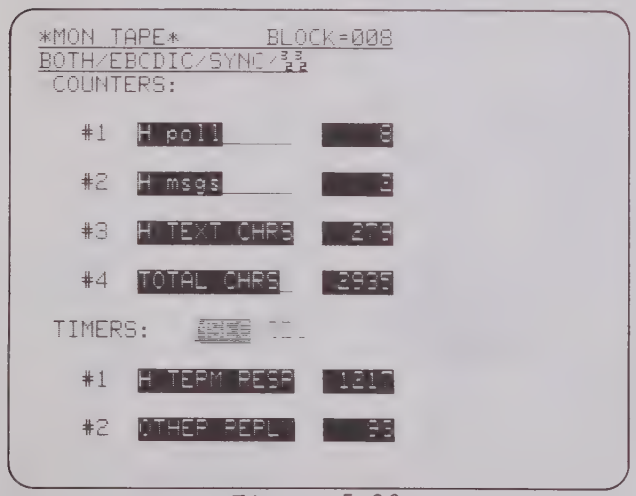

Figure 5-20

The most often encountered situation occurs during modem shutdown on a multi-drop network. This causes a "garbage" character (or two) to follow a few pads after the last valid data character.

When several individual characters are alternately displayed from the DCE and DTE the dual line display should be selected.

Using the Parameters 2 CRT menu, simply select DUAL line; then MONITOR.

- DTE data appears beginning on the top line.

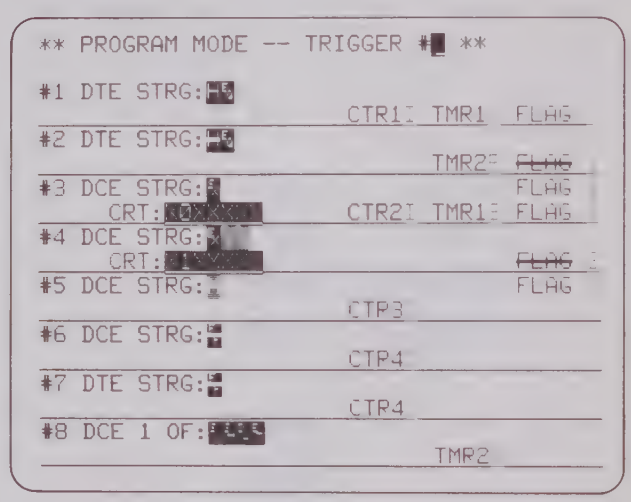

Figure 5-21

- DCE (underlined) data appears beginning on the second and alternating lines.

- Time correlation is maintained during simultaneous transmissions by the fill symbol, which is a low-intensity block L.

Dual-line display is essential for clearly displaying simultaneous FDX data. However, it should only be used when required because the single-line display uses the CRT and buffer space more efficiently.

6 Recording

NOTE: New tapes should be preformatted before they are used for data recording because otherwise the 3500 can only find Block 000. Complete instructions for preformatting may be found in the Technical Manual.

6.1 SAVING A PROGRAM

CAUTION: Do not use the training tape to save a program.

The program that has now been developed could have future application. It can easily be saved on tape.

CAUTION: Always verify a tape as blank (or as having a program that is no longer of interest) before SAVING a program on it. This must be done before the new program is developed to avoid the possibility of writing over it with whatever may be on the tape.

a. Insert the tape and press LOAD PROGram: the name of any resident program or "NO PROGRAM FOUND" will be displayed.

b. Remove the cartridge and position the RECORD tab toward the outside of the case.

1. After the desired program has been developed in the 3500, insert a new tape, with the RECORD tab in the ON position (toward the outside of the case). Press the SAVE PROGram key; then PROGRAM and the Program Selections menu will appear.

2. Always operate the LOAD PROG key to verify that the program has transferred to the tape. The operator should review each of the four menus--

Parameters 1, Basic Monitor.

Parameters 2, CRT and TAPE.

Trigger Summary.

Statistics, Counter and Timer.

3. Remove the tape and position the RECORD tab to the center of the case to protect the tape.

4. Fill out a label with the program menu and attach it to the case.

6.2 RECORDING DATA

6.2.1 Manual Recording. Only one operation is required for manual recording:

1. The RECORD tab of the tape must be toward the outside edge of the case.

2. In the MONITOR mode, operate the MANUAL START key in the CAPTURE MEMORY zone of the keyboard.

3. The RECORD LED on the panel will be ON and the BLOCK number will increment for each 2000 characters received.

4. To stop recording, press MANUAL STOP.

6.2.2 Program Control. When LINE has been selected as data source, triggers can be used to start and (or) stop the recording of data. The RECORD and TRIGGER LEDs on the panel indicate whether the tape is recording.

6.2.3 Override. When the tape is under program trigger control, the operator may use the MANUAL START, MANUAL STOP, and RESUME TRIGGER keys to override the triggers in the same way that the CRT Freeze display can be overridden.

Appendix A
INTERVIEW 3000

This training manual can be used with the INTERVIEW 3000 (which does not have a tape). The following considerations are important.

1. Obtain a BISYNC signal source. Connect the signals to be monitored to the rear RS-232 connector. In PROGRAM mode, the Parameters 1 display will show SOURCE:LINE for all tests.

2. Throughout, use the figures in the manual to help understand the content before you apply it to your own displayed data.

3. Omit the instructions (in Sections 2.2 and 2.3, especially) for loading a taped program.

4. The 3000 user will be developing all his programs from the power-up default BISYNC program. Therefore, before editing his data will be displayed without enhancements.

5. The following are some specific points to consider.

Sections 3.1, 3.2--The user's displays will show line data without enhancements.

Omit Section 4.1.

Sections 4.2-5.4--Displays will show user's data.

Section 4.4: Omit Step 1.

Section 5.2.2: Ignore the reference to the training tape program.

Omit Section 6.

6. An INTERVIEW 3000 may be field-upgraded to a 3500 by adding a Tape Upgrade Kit, OPT-895-01-2. Please specify serial number and software version (see power-up display of your unit) when ordering.

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ASYNC TRAINING MANUAL
for
INTERVIEW® 3000 and 3500

Atlantic Research Corporation Teleproducts Division
5390 Cherokee Avenue, Alexandria, Virginia 22314

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Notice

This training manual is intended for use with Series B 3500 units of software level 3.04 and ASYNC Training Tape TAP-895-103-1. Data recorded with any 3500 software may be played back in units of any software level. Recorded programs are "upward compatible"; that is, programs recorded with earlier software will load and run in a 3.04 unit, but programs saved in a 3.04 unit will not load into units with earlier software.

Atlantic Research Corporation reserves the right to make improvements to the manual and tape without prior notice. Further tape revisions, beyond 103-1, will not necessarily affect correlation with this manual.

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1 Introduction

This ASYNC Training Manual is based on the INTERVIEW 3500 ASYNC Training Tape (TAP-895-103.1). For users with asynchronous circuits, this combination supplements the BISYNC Training Manual (ATLC-107-895-102) and the BISYNC Training Tape (TAP-895-102.1).

The applications in this ASYNC Manual are intended for systems using the EIA RS-232 interface, as the trigger settings are based on RS-232/V.24 lead status.

You should be familiar with Sections 1 and 2 of the BISYNC Training Manual before you begin to work with this ASYNC Training Manual; in other words, you should be familiar with the keyboard and status indicator panels, and know how to power up the unit. For ASYNC applications, you should eventually read both manuals, because you will find that the applications information in the two manuals is complementary.

2 Power-up

If you have not had the opportunity to power up the 3500 and load a recorded program, you should consult Section 2 of the BISYNC Training Manual or Section 7 of the Technical Manual.

When the 3500 is powered up with the ASYNC training tape installed, the TAPE line of the Power-up menu should appear as in Figure 2-1. The code will always be 103, but there may be differences in the version number.

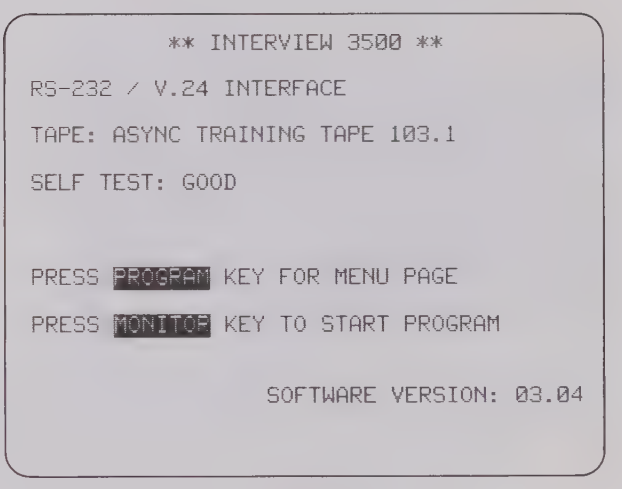
** INTERVIEW 3500 **
RS-232 / V.24 INTERFACE
TAPE: ASYNC TRAINING TAPE 103.1
SELF TEST: GOOD
PRESS PROGRAM KEY FOR MENU PAGE
PRESS MONITOR KEY TO START PROGRAM
SOFTWARE VERSION: 03.04

Figure 2-1

3 Monitor Mode

With the tape installed, power up the 3500 and press the green rectangular MONITOR key to put the unit in Monitor Mode. This key enables all the green keys on the keyboard and also permits a number of other keys to be used for special functions available only in Monitor Mode.

Notice (see Figure 3-1) that the second line of the display indicates that the unit is set to receive ODD-parity ASCII data in ASYNChronous format on BOTH TD and RD lines.

Figures 3-2 and 3-3 show the taped data as it is displayed by the program on the training tape. The same block of data is repeated throughout the tape for training purposes. It simulates a half-duplex, 1200-bps dial- modem circuit.

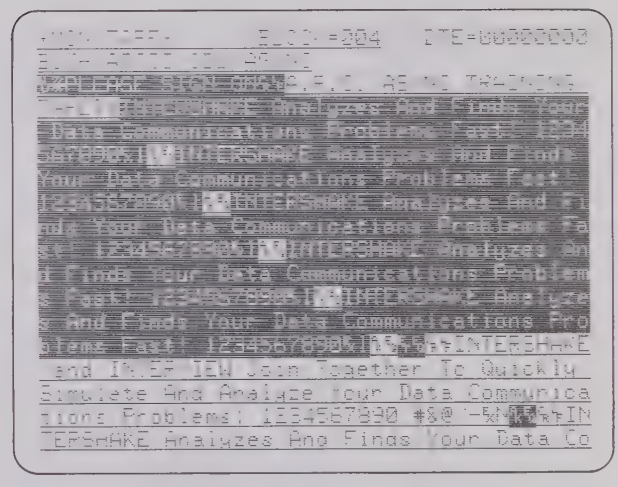

Figure 3-2

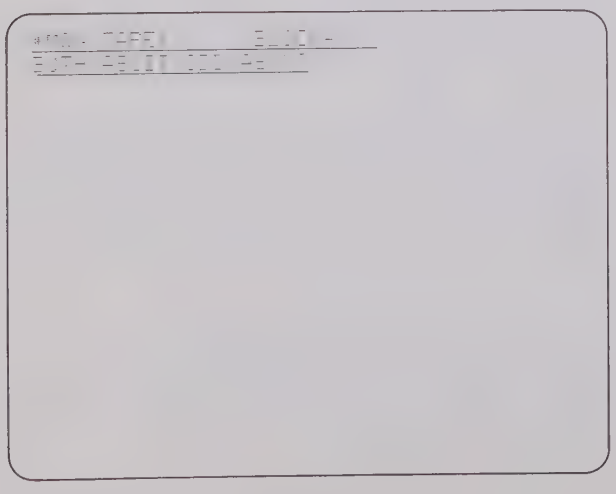

Figure 3-1

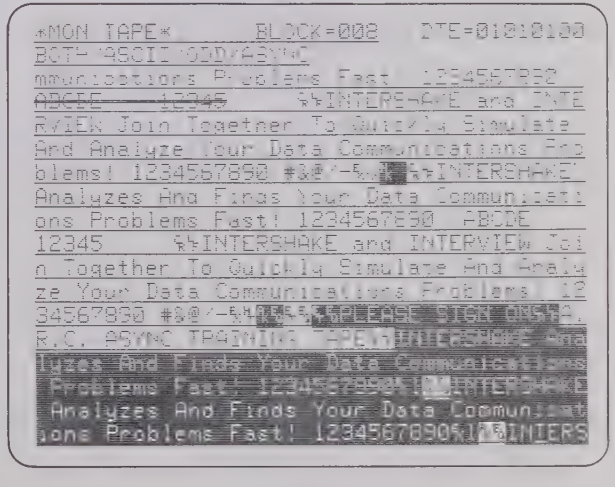

Figure 3-3

The half-duplex data is shown in single-line display, DTE data alternating with DCE data. In the 3500, data from the DCE line is always distinguished by underlining.

Interface leads have been recorded. If you watch the indicators on the EIA status panel, you can see that the leads normally used with this type of circuit are all active. Data received while RTS is ON is displayed in reverse image by the training tape program.

Press the RESULTS key to see real-time counter and timer readings (see Figure 3-4). Press the DATA key to again view the data.

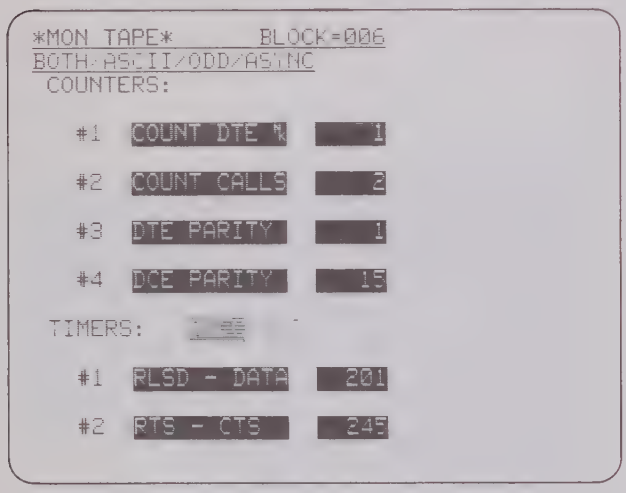

Figure 3-4

The taped data was recorded at 1200 bps and the taped program replays the data at the same speed. However, if you would like to see the correlation between the data display and the EIA lead status, you can slow down the tape replay and thus increase the ON time of the EIA indicators until you can easily observe the lead activity. Press the DOWN cursor arrow several times in succession. Each time you press the DOWN arrow, the playback speed is halved, down to a minimum of approximately 14 bps. To speed up the display, press the UP cursor arrow. The UP arrow doubles the playback speed, up to a maximum of 9.6 kbps. Remember that this change in the playback speed invalidates the timer values.

To rewind the tape at any time during playback, simply press PROGRAM, then MONITOR. The tape will rewind to Block 000 before it begins to play again, and all measurements will be reset.

The data simulates a user dialing into a typical ASYNC port. The ring indicator (RI) is pulsed three times. On the third ring, DTR is raised to answer the call and DSR is raised, which completes the answer handshaking routine.

For each Transmit message, the RTS lead is raised, there is a wait for CTS to come on, the data is transmitted, and RTS and CTS are dropped.

Each Receive message is indicated by RLSD lead ON, followed by RD ON and RLSD OFF.

The first transmit message is PLEASE SIGN ON. Several data blocks are sent back and forth with both good data and parity errors.

A line through a character indicates a parity error (see Figure 3-3). As you can see from the figure, the training tape block containing parity errors is NAK'd and retransmitted without parity errors. NAKs from the DTE are announced with an audible alarm.

Each text block ends with an odd-parity LRC check. A basic ACK, ENQ, NAK protocol is used.

Section 3 of the BISYNC Training Manual explains many other 3500 Monitor Mode capabilities that are useful for monitoring asynchronous circuits.

The INTERVIEW 3500 Technical Manual includes code conversion charts for all the code selections on the Parameters 1 menu.

Press the PROGRAM key to stop tape motion and remove the training tape.

4 Program Mode: Basic Parameters

4.1 PARAMETERS 1: BASIC MONITOR

Power up the INTERVIEW 3500. The TAPE line of the Power-up screen will blink the message TAPE NOT INSTALLED. Insert the ASYNC training tape and press the red PROGRAM key.

Press the PARAMETERS key followed by the number 1, to display the BASIC MONITOR menu shown in Figure 4-1. Notice that the TEST ID line on the menu is blank, with the cursor positioned at the beginning of the field. This is because, although the training tape has been inserted, you have not loaded the training tape program. This gives you the opportunity to enter an ASYNC program yourself.

Use the LOCK key to lock in SHIFT; then on the TEST ID line, enter a name for your program, ASYNC TRAINING TAPE. Press SHIFT to release the lock, and add the training tape's numerical code designation, 103.1. The test identifier may consist of up to 27 characters and include any alpha, numeric, or control characters (spaces count).

Use the ENTER key to move to the next line, the SOURCE field. The blinking cursor is now positioned on the default selection, LINE. Since our data source will be the training tape, move the cursor to TAPE using the RIGHT cursor arrow key. Notice that TAPE is blinking.

When TAPE has been selected, a new line appears, the START field. The default selection is BLOCK 000 of the tape. Since the only data on the training tape is the ASYNC data that we want to monitor, the default selection is suitable. If you use any of the cursor arrows, you will alter your selection, so use the ENTER key to move from TAPE to this field. Press ENTER again to enter BLOCK 000 and move to the MONITOR field.

The default selection in the MONITOR field is BOTH, which instructs the 3500 to monitor both DTE

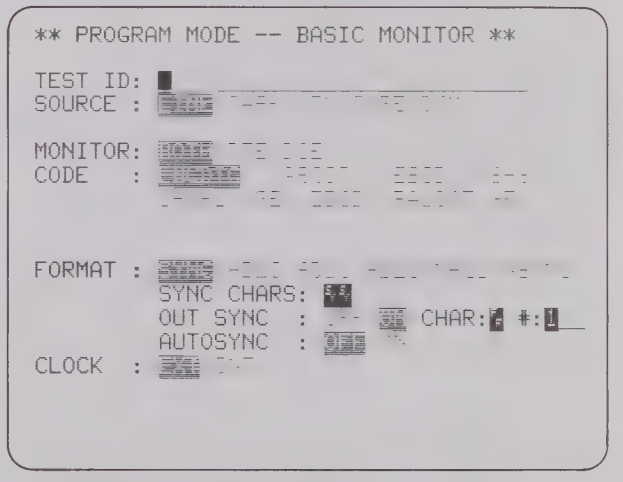

Figure 4-1

and DCE. Press ENTER again to put the cursor in the CODE field. The Parameters 1 menu should now appear as in Figure 4-2.

With the RIGHT cursor arrow, move the cursor to ASCII and notice that two new fields are now enabled

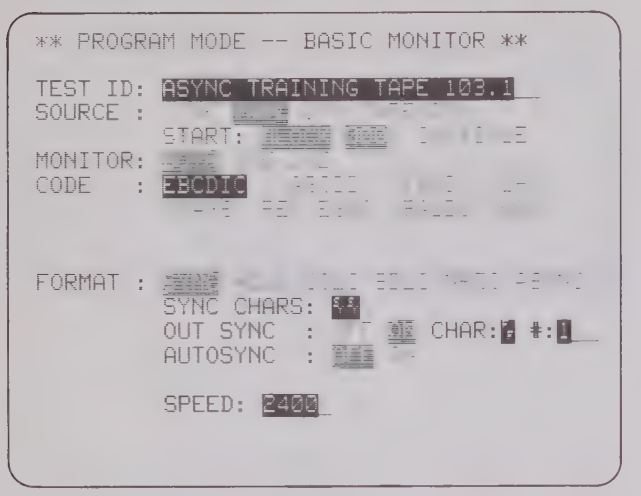

Figure 4-2

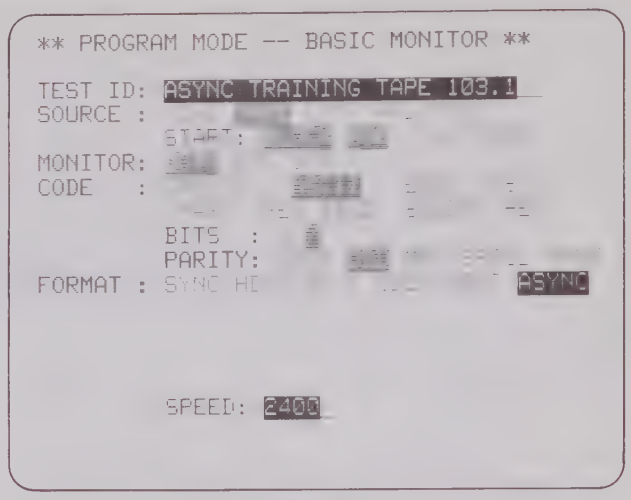

Figure 4-4

following the two lines of the CODE field (see Figure 4-3). The data on the training tape is 7 bits, odd parity. Both of these are default selections, so you can go directly to the FORMAT field using the ENTER key. Use the cursor arrow to move from the default selection, SYNC, to ASYNC and notice that all the remaining selections in the format field disappear (see Figure 4-4). Other selections are not necessary because the 3500 does not have to refer to the stop bit or stop bit length to display asynchronous data.

The speed of the training tape data is 1200 bps. In the speed field, therefore, replace the default entry with 1200. You may enter a lower speed to enable you to follow the interactions of the EIA status indicators, but if you do, you should be careful to consider this or to change the entry back to 1200 before you use any data from the timers. The Parameters 1 menu should now look like Figure 4-5.

You have entered all the basic parameters necessary to monitor the training tape data. Press the MONITOR key and observe the data flow (see Figure 4-6).

The display now appears similar to that given by the training tape program (Section 3, Figure 3-3). However, the only enhancement is the underline that always distinguishes DCE data. TD data is not displayed in reverse image. Characters with parity errors are not indentified by horizontal bars.

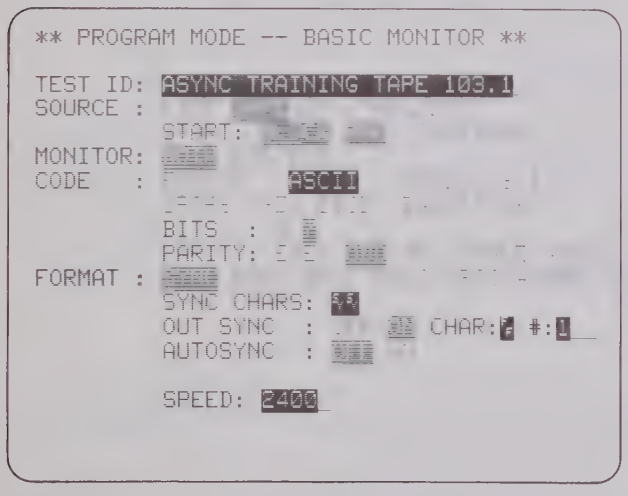

Figure 4-3

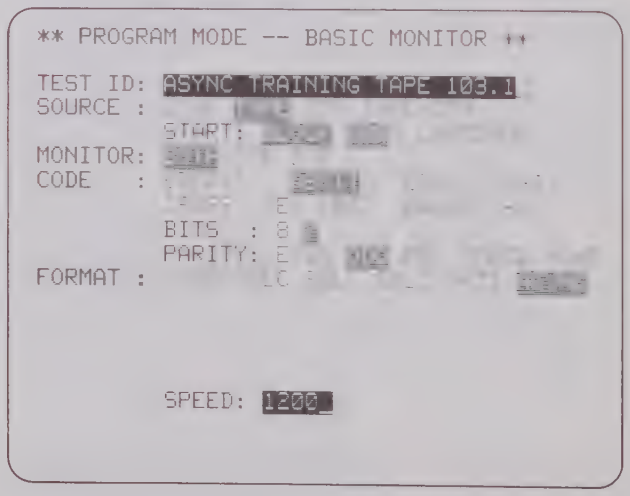

Figure 4-5

4.2 PARAMETERS 2: CRT CONTROL

Now press PROGRAM, PARAMETERS, and numeral 2 to obtain the CRT & TAPE menu shown in Figure 4-7.

Use the ENTER key to go to the ENHANCE field. Select PARITY; then press the MONITOR key. All characters with parity errors are now identified on the display by horizontal bars, and the display (Figure 4-8) is almost the same as you obtained with the training tape

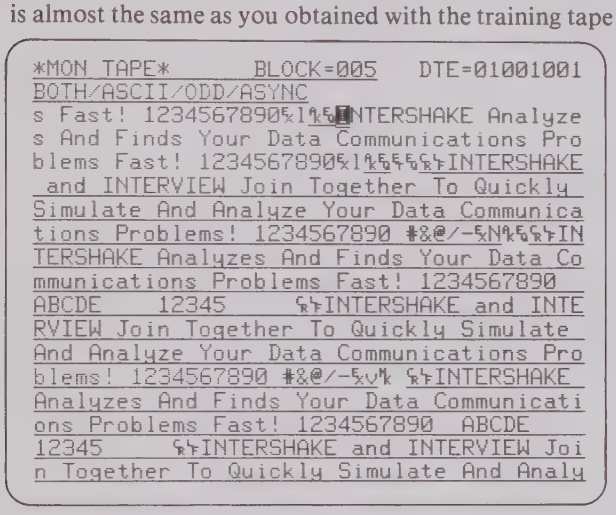
MON TAPE BLOCK=005 DTE=01001001
BOTH/ASCII/ODD/ASYNC
s Fast! 1234567890%l%%INTERSHAKE Analyze
s And Finds Your Data Communications Pro
blems Fast! 1234567890%l%%%%%INTERSHAKE
and INTERVIEW Join Together To Quickly
Simulate And Analyze Your Data Communica
tions Problems! 1234567890 #&@/-%N%%%IN
TERSHAKE Analyzes And Finds Your Data Co
mmunications Problems Fast! 1234567890
ABCDE 12345 %%INTERSHAKE and INTE
RVIEW Join Together To Quickly Simulate
And Analyze Your Data Communications Pro
blems! 1234567890 #&@/-%v% %%INTERSHAKE
Analyzes And Finds Your Data Communicati
ons Problems Fast! 1234567890 ABCDE
12345 %%INTERSHAKE and INTERVIEW Joi
n Together To Quickly Simulate And Analy

Figure 4-6

program. The 3500 will check parity for EVEN, ODD, MARK, or SPACE parity as chosen on the Parameters 1 menu. Selecting ENHANCE PARITY also enables some special program instructions, which will be explained in the section on Triggers.

Reverse-image enhancement will be added using the Triggers.

Do not turn off the unit: you will need the program you just entered for the next section.

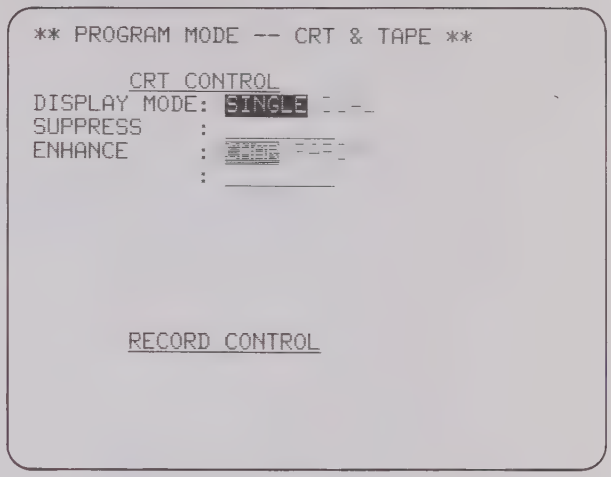

Figure 4-7

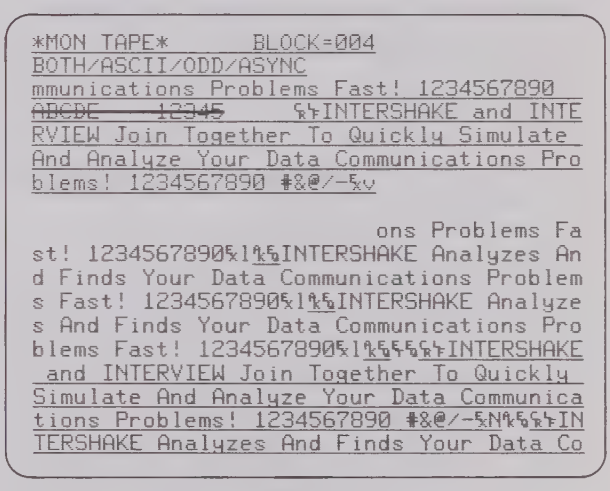
MON TAPE BLOCK=004
BOTH/ASCII/ODD/ASYNC
mmunications Problems Fast! 1234567890
ABCDE 12345 %%INTERSHAKE and INTE
RVIEW Join Together To Quickly Simulate
And Analyze Your Data Communications Pro
blems! 1234567890 #&@/-%v
ons Problems Fa
st! 1234567890%l%%INTERSHAKE Analyzes An
d Finds Your Data Communications Problem
s Fast! 1234567890%l%%INTERSHAKE Analyze
s And Finds Your Data Communications Pro
blems Fast! 1234567890%l%%%%%INTERSHAKE
and INTERVIEW Join Together To Quickly
Simulate And Analyze Your Data Communica
tions Problems! 1234567890 #&@/-%N%%%IN
TERSHAKE Analyzes And Finds Your Data Co

Figure 4-8

5 Program Mode: Triggers

5.1 RS-232 LEADS

Figure 5-1 diagrams, for the simulated training tape data, the sequence of EIA lead activity seen on the interface when a call is answered. For pin assignments of the leads, see Table 5-1.

5.2 TRIGGER MENUS

Press PROGRAM, if your unit is still in Monitor Mode; then TRIGGER. This displays the Trigger Summary (Figure 5-2), which is identical to the Program Summary that can be observed in Monitor Mode. In this

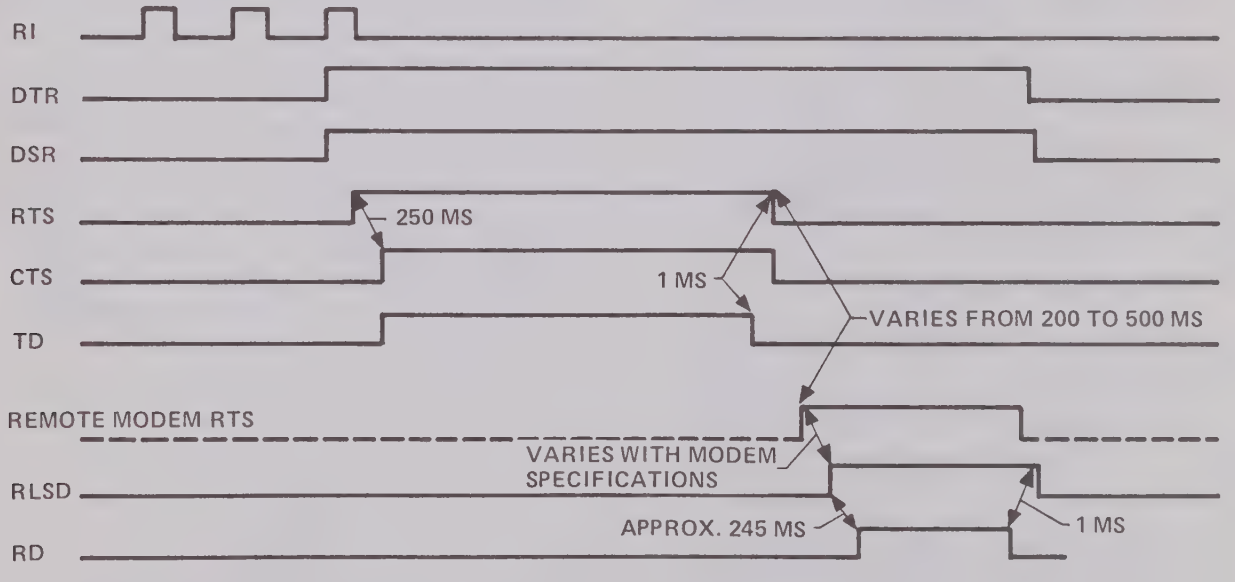

Figure 5-1

Table 5-1 EIA RS-232/V.24 Pin Assignments

Pin	Circuit EIA	Circuit V.24	Description
1	AA	101	Protective ground
2	BA	103	TD: Transmitted data
3	BB	104	RD: Received data
4	CA	105	RTS: Request to send
5	CB	106	CTS: Clear to send
6	CC	107	DSR: Data set ready
7	AB	102	Signal ground
8	CF	109	RLSD: Received line signal detect (carrier detect)
9	—	—	(Data set testing)
10	—	—	(Data set testing)
11	—	—	Unassigned
12	SCF	122	SRLSD: Secondary received line signal detect
13	SCB	121	SCTS: Secondary clear to send
14	SBA	118	STD: Secondary transmitted data
15	DB	114	SCT: Serial clock transmit
16	SBB	119	SRD: Secondary received data
17	DD	115	SCR: Serial clock receive
18	—	—	Unassigned
19	SCA	120	SRTS: Secondary request to send
20	CD	108/2	DTR: Data terminal ready
21	CG	110	SQ: Signal quality detector
22	CE	125	RI: Ring indicator
23	CH/CI	111/112	Data signal rate select
24	DA	113	SCTE: Serial clock terminal source
25	—	—	Unassigned

case, the summary is almost blank, because you have not loaded the training tape program. Now press the numeral 1 key to obtain the Trigger 1 menu display, as shown in Figure 5-3. Press TRIGGER and 2 to obtain the Trigger 2 menu. The 3500's eight trigger menus can each be displayed in this fashion.

5.3 COUNTING PARITY ERRORS

By now, you are probably wondering why there are two entries on the Trigger Summary (Figure 5-2) that

```
** PROGRAM MODE -- TRIGGER #  **

#1
#2
#3
#4
#5
#6
#7 DTE PARITY
                        CTR3
#8 DCE PARITY
                        CTR4
```

Figure 5-2

```
** PROGRAM MODE -- TRIGGER #1 **

MON DATA ON  : NEITHER

MON I/F LEADS:

MON FLAG     :

SET CRT  :

SET TAPE :
SET FLAG :
SET TIMER: NO YES
SET CNTR :
SET ALARM:
```

Figure 5-3

you did not put there. When you select Enhance Parity on the Parameters 2 menu (CRT Control), Counters 3 and 4 are automatically set to count parity errors in DTE and DCE data, respectively. If you will look at the menu for Trigger 7 (Figure 5-4), you can see that on the third line, MON DATA has been automatically changed to MON PaRiTY ON DTE and CouNTeR 3 is set to INCrement. Trigger 8 (Figure 5-5) is set to look for parity errors coming from the DCE and to count them on Counter 4. Counters 3 and 4 have been automatically named on the Statistics menu. Press the red STATISTICS key to obtain the display of Figure 5-6. To see the two counters in operation press MONITOR and then, when data is displayed, the RESULTS key (see Figure 5-7). You can clear Triggers 7 and 8 by pressing CONTROL plus CLEAR FIELD while each menu is displayed. Clearing ENHANCE PARITY on the Parameters 2 menu will not clear the counter actions on the menus for Triggers 7 and 8.

```
** PROGRAM MODE -- TRIGGER #7 **

MON PRTY ON  :

MON I/F LEADS: NO YES

MON FLAG     :

SET CRT  :

SET TAPE :
SET FLAG :
SET TIMER:
SET CNTR :
SET ALARM:
```

Figure 5-4

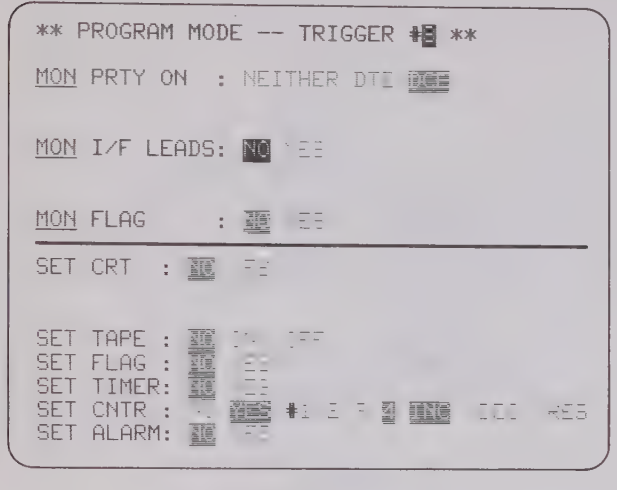
** PROGRAM MODE -- TRIGGER #1 **
MON PRTY ON : NEITHER DTE DCE
MON I/F LEADS: NO YES
MON FLAG : NO YES
SET CRT : NO YES
SET TAPE : NO ON OFF
SET FLAG : NO YES
SET TIMER: NO YES
SET CNTR : NO YES #1 1 2 INC DEC YES
SET ALARM: NO YES

Figure 5-5

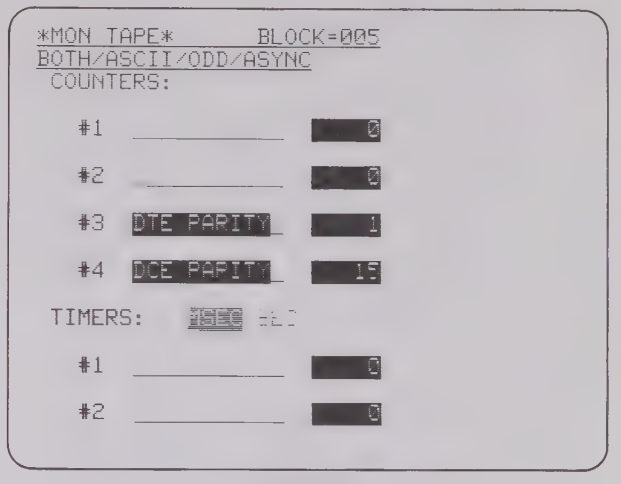

Figure 5-7

5.4 MEASURING RTS-CTS DELAY

5.4.1 Remote Modem. Now, return to the Trigger 1 menu. The first measurement you will try yourself is to measure the delay from the remote modem's RTS to CTS. With ENTER, move the cursor to the MON I/F LEADS line; select YES. A new line will appear (see Figure 5-8) offering a mask of EIA leads. You can instruct the trigger to look for the leads to be ON (1), OFF (0), or Don't Care in any combination. In this case, enter a 1 for RLSD. With the ENTER key, go to the SET TIMER line and select YES. Two more fields appear to the right of this one. Take the default selections, which are Timer 1 and ReSTaRT. Timer 1 will reset and start whenever RLSD becomes active (ON). Figure 5-9 shows the completed Trigger menu.

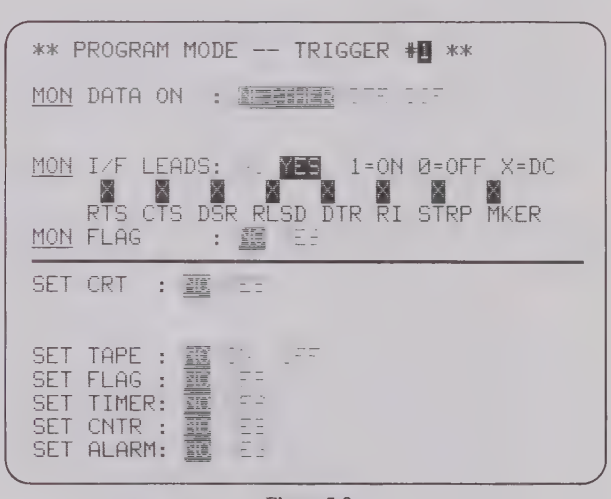
** PROGRAM MODE -- TRIGGER #1 **
MON DATA ON : NEITHER OFF OFF
MON I/F LEADS: YES 1=ON 0=OFF X=DC
X X X X X X X X
RTS CTS DSR RLSD DTR RI STRP MKER
MON FLAG : NO YES
SET CRT : NO YES
SET TAPE : NO ON OFF
SET FLAG : NO YES
SET TIMER: NO YES
SET CNTR : NO YES
SET ALARM: NO YES

Figure 5-8

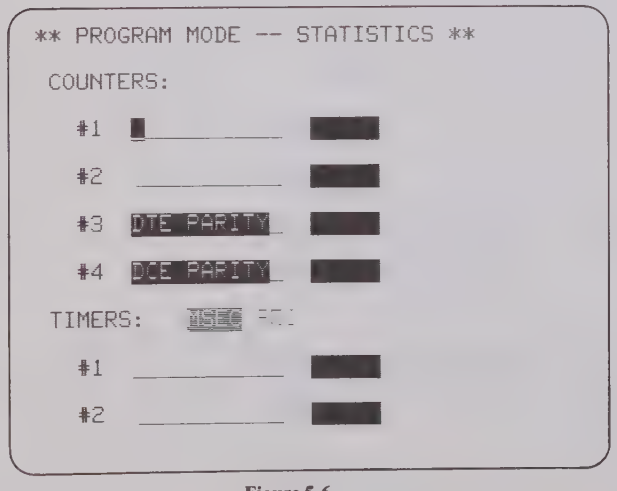

Figure 5-6

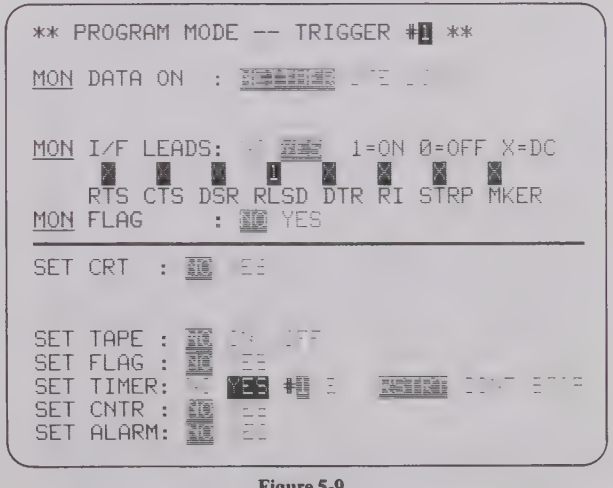
** PROGRAM MODE -- TRIGGER #1 **
MON DATA ON : NEITHER OFF OFF
MON I/F LEADS: YES 1=ON 0=OFF X=DC
X X X 1 X X X X
RTS CTS DSR RLSD DTR RI STRP MKER
MON FLAG : NO YES
SET CRT : NO YES
SET TAPE : NO ON OFF
SET FLAG : NO YES
SET TIMER: YES #1 1 RESTART INC DEC
SET CNTR : NO YES
SET ALARM: NO YES

Figure 5-9

Display the Trigger 2 menu. We want Timer 1 to stop when the first DCE data is received after RLSD becomes active. On the first line, select DCE. Two more lines immediately appear. The default selection in the next line is STRinG. Underneath it is a data-entry field, in which you can enter any string of up to eight characters. We are interested in only one character, the first character received, no matter what it is. Position the cursor on the data-entry line and press the red DON'T CARE key once. Go to the SET TIMER line; select YES. Then use the ENTER key to select #1, and to get to the rightmost field. With the cursor arrow, select STOP (see Figure 5-10).

Press the STATISTICS key to display a menu which enables you to name the counters and timers you are using in your program. Label Timer 1 RLSD-DATA (see Figure 5-11).

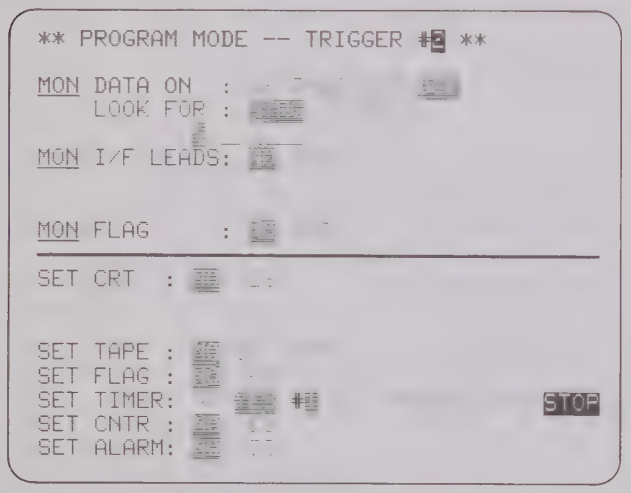

Figure 5-10

MONITOR the training tape data and press the RESULTS key to obtain the counter and timer menu with real-time results displayed. You can easily read and record the value for Timer 1 each time it stops (Figure 5-12). You may notice a very low count just before the NAK alarm sounds. This is caused by a carrier dropout responsible for the rejected block: Timer 1 resets whenever RLSD comes on.

If you add the reading obtained from Timer 1 to the modem manufacturer's specification for modem delay, you will probably obtain a figure within 5 ms of the actual RTS-CTS delay for the remote modem.

5.4.2 Local Modem. We shall use Timer 2 to determine the local modem RTS-CTS delay. On Trigger 3, set Timer 2 to ReSTaRT when RTS comes ON (1). (See

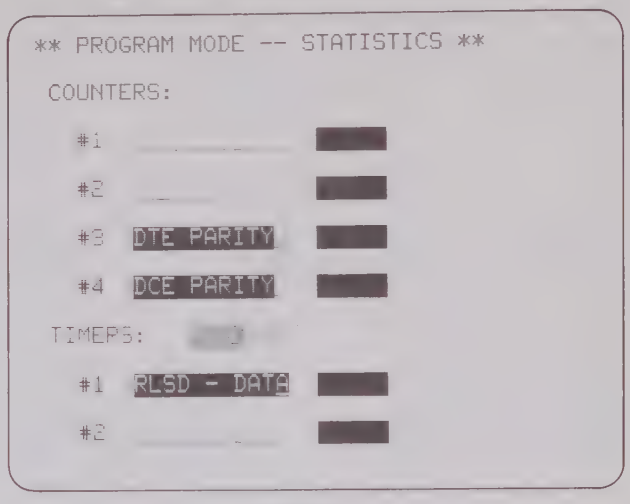

Figure 5-11

Figure 5-13.) On Trigger 4, set Timer 2 to STOP when CTS goes ON (1). (See Figure 5-14.) On the Statistics menu, label Timer 2, RTS-CTS.

On the Results display, as with Timer 1, you can easily read each total value as it is displayed.

5.5 COUNTING REJECTED BLOCKS

Program Trigger 5 to count DTE NAKs, and thus count rejected DCE blocks. Select DTE, and then STRinG. Enter NAK on the data-entry line by pressing CONTROL plus NAK simultaneously. Select SET CNTR, YES, #1, and INCrement (the default choices). Then select ALARM: YES (see Figure 5-15). On the Statistics menu, label Counter 1, COUNT DTE NK. MONITOR the tape and look at the RESULTS display. Every NAK received from the DTE will be counted and announced with the audible alarm, just as when the training tape program was loaded.

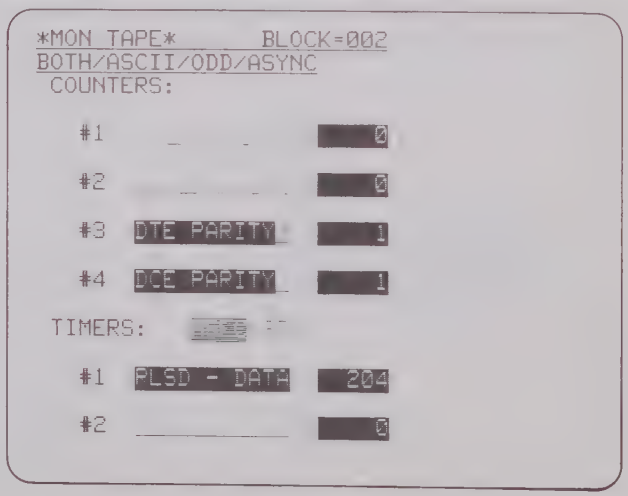

Figure 5-12

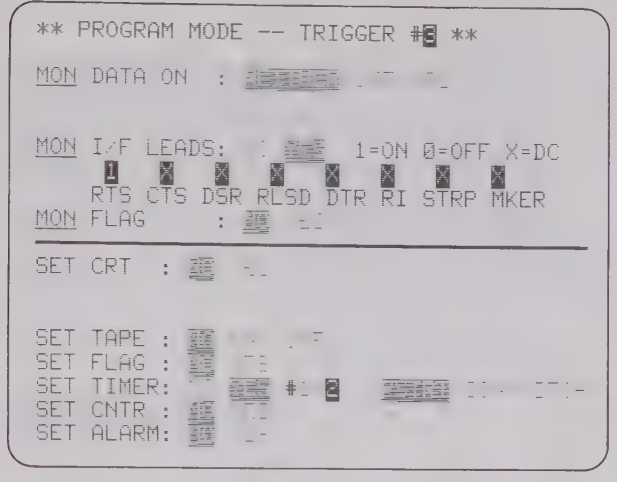
** PROGRAM MODE -- TRIGGER #3 **
MON DATA ON :
MON I/F LEADS: 1=ON 0=OFF X=DC
RTS CTS DSR RLSD DTR RI STRP MKER
MON FLAG :
SET CRT :
SET TAPE :
SET FLAG :
SET TIMER:
SET CNTR :
SET ALARM:

Figure 5-13

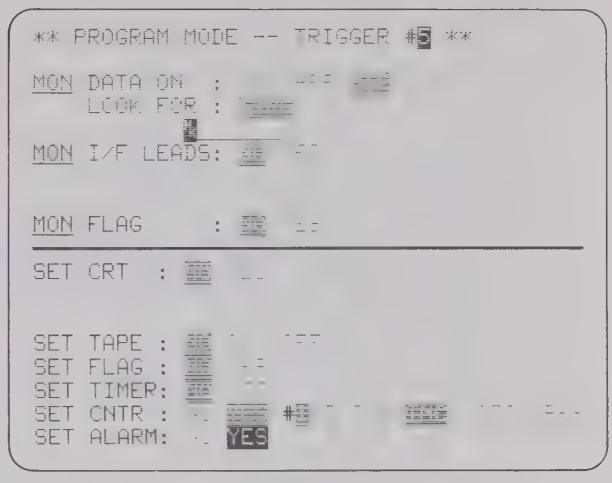

Figure 5-15

5.6 COUNTING CALLS

On Trigger 6, count the number of calls on this circuit; that is, the number of times that DTR is raised. Select I/F LEADS, and enter a 1 for DTR. Select SET CNTR, YES, #2, INC. (See Figure 5-16.) On the Statistics menu, label Counter 2, COUNT CALLS.

5.7 REVERSE-IMAGE ENHANCEMENT

We have still not added the reverse-image enhancement of DTE data that is in the training tape program. Display Trigger 3, which is already set to monitor RTS ON. Select SET CRT: YES. A mask of CRT enhancements now appears on the next line. Position the cursor on the REV box and enter a numeral 1 to turn reverse image ON. (See Figure 5-17.)

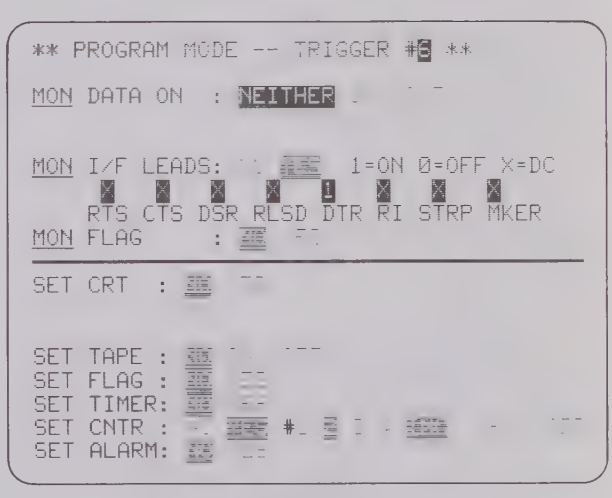
** PROGRAM MODE -- TRIGGER #3 **
MON DATA ON : NEITHER
MON I/F LEADS: 1=ON 0=OFF X=DC
RTS CTS DSR RLSD DTR RI STRP MKER
MON FLAG :
SET CRT :
SET TAPE :
SET FLAG :
SET TIMER:
SET CNTR :
SET ALARM:

Figure 5-16

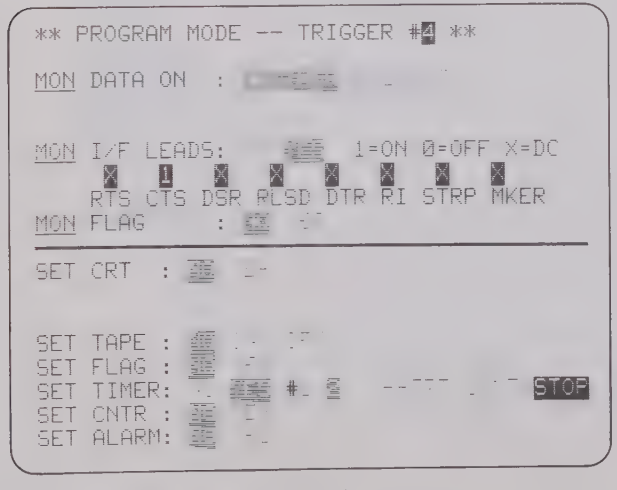
** PROGRAM MODE -- TRIGGER #4 **
MON DATA ON :
MON I/F LEADS: 1=ON 0=OFF X=DC
RTS CTS DSR RLSD DTR RI STRP MKER
MON FLAG :
SET CRT :
SET TAPE :
SET FLAG :
SET TIMER: STOP
SET CNTR :
SET ALARM:

Figure 5-14

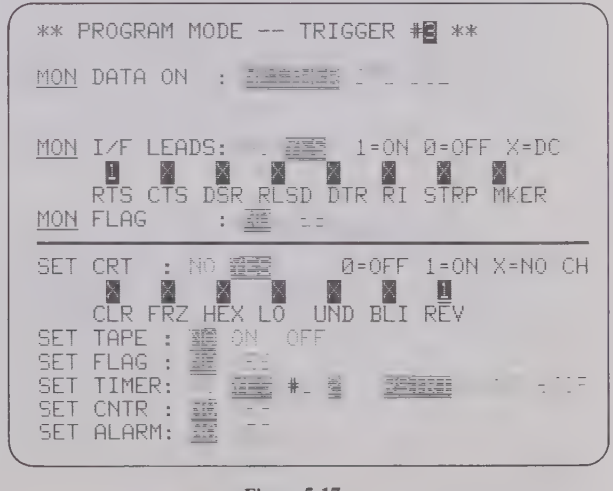
** PROGRAM MODE -- TRIGGER #3 **
MON DATA ON :
MON I/F LEADS: 1=ON 0=OFF X=DC
RTS CTS DSR RLSD DTR RI STRP MKER
MON FLAG :
SET CRT : NO 0=OFF 1=ON X=NO CH
CLR FRZ HEX LO UND BLI REV
SET TAPE : ON OFF
SET FLAG :
SET TIMER:
SET CNTR :
SET ALARM:

Figure 5-17

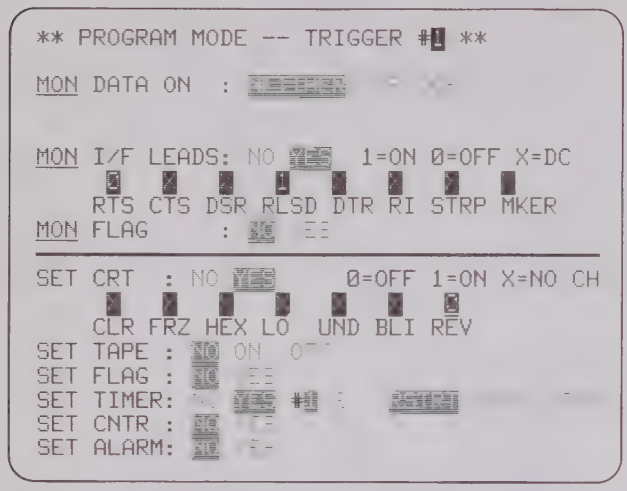
** PROGRAM MODE -- TRIGGER #1 **
MON DATA ON :
MON I/F LEADS: NO 1=ON 0=OFF X=DC
RTS CTS DSR RLSD DTR RI STRP MKER
MON FLAG :
SET CRT : NO 0=OFF 1=ON X=NO CH
CLR FRZ HEX LO UND BLI REV
SET TAPE :
SET FLAG :
SET TIMER:
SET CNTR :
SET ALARM:

Figure 5-18

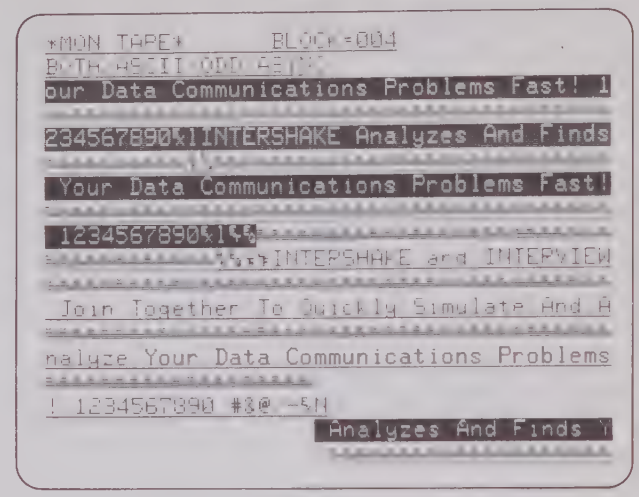
MON TAPE BLOCK=004
our Data Communications Problems Fast! 1
2345678901INTERSHAKE Analyzes And Finds
Your Data Communications Problems Fast!
1234567890
INTERSHAKE and INTERVIEW
Join Together To Quickly Simulate And A
nalyze Your Data Communications Problems
! 1234567890 #&@
Analyzes And Finds Y

Figure 5-20

Notice from the Trigger Summary that Trigger 1 is set to monitor RLSD ON (1). Enter a 0 in the box for RTS. Under SET CRT, enter a 0 in the REV box to turn reverse image OFF. (See Figure 5-18.)

NOTE: This will work because RLSD comes on only when RTS goes off. You could not, for instance, have set this trigger to turn the reverse-image enhancement ON, because all conditions must be true for the actions take place.

MONITOR the data and notice that the DTE data is now reverse-imaged, making it easy to distinguish DTE and DCE data at a glance (see Figure 5-19).

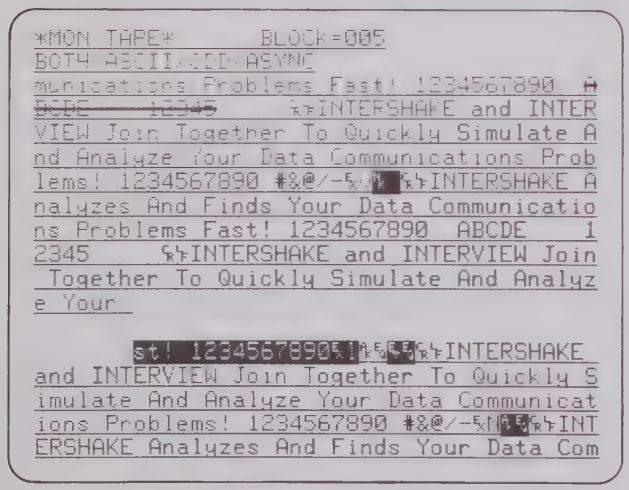
MON TAPE BLOCK=005
BOTH ASCII ODD ASYNC
munications Problems Fast! 1234567890
INTERSHAKE and INTER
VIEW Join Together To Quickly Simulate A
nd Analyze Your Data Communications Prob
lems! 1234567890 #&@/-
INTERSHAKE A
nalyzes And Finds Your Data Communicatio
ns Problems Fast! 1234567890 ABCDE 1
2345 INTERSHAKE and INTERVIEW Join
Together To Quickly Simulate And Analyz
e Your
st! 1234567890
INTERSHAKE
and INTERVIEW Join Together To Quickly S
imulate And Analyze Your Data Communicat
ions Problems! 1234567890 #&@/-
INT
ERSHAKE Analyzes And Finds Your Data Com

Figure 5-19

Figure 5-20 shows reverse-image enhancement of the same taped data in dual line display.*

5.8 TRIGGER SUMMARY

Now look at the completed Trigger Summary (Figure 5-21) and compare it with your trigger menus. Once you understand how the summary abbreviates your entries, you will find it is an invaluable help in reviewing your program. You may see it any time you are in Monitor Mode simply by pressing the Program Summary key.

*Under some conditions, reverse-image enhancement of line data may be skewed by two characters.

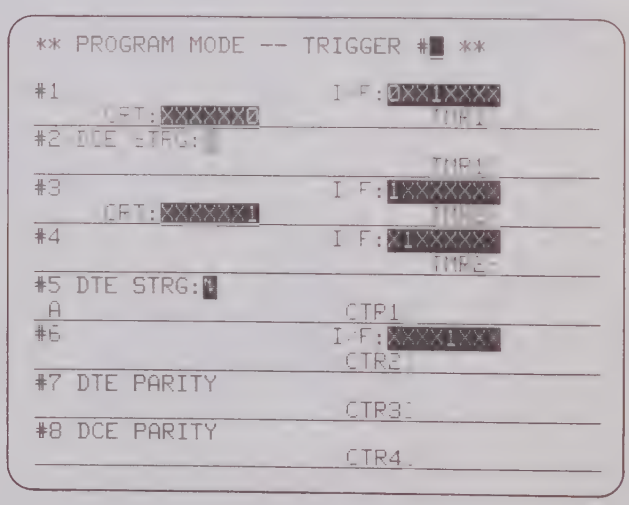

Figure 5-21

6 Dual-Line Data Display

To see the training tape in dual-line display, select the Parameters 2 menu and position the cursor on DUAL LINE (Figure 6-1). Figure 6-2 shows dual-line display of full-duplex asynchronous data. The 3500 indicates idle time by an L-shaped fill symbol to maintain the time correlation between the two data streams.

Please notice that in dual-line display the relationship between the Transmit and Receive data is accurate to within plus or minus 1 character. This is shown on the first line of the data in Figure 6-2, where the first received character (A) is directly under the last transmitted character (LF). This will be true of turnaround time for each transmit-receive sequence.

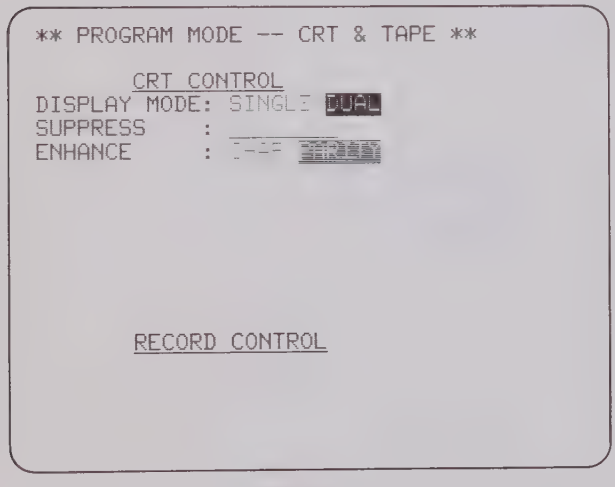

Figure 6-1

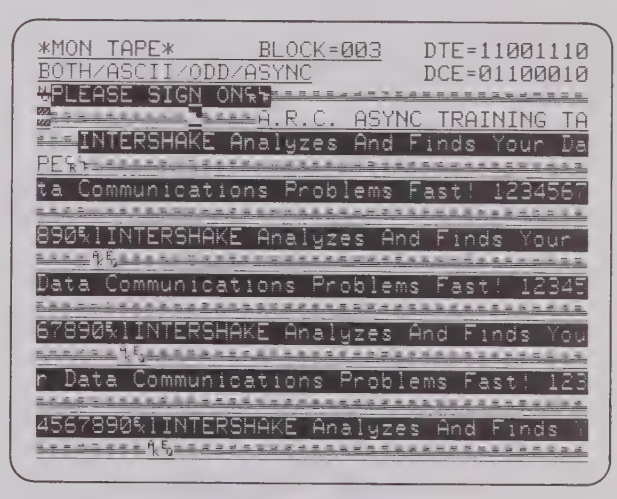
MON TAPE BLOCK=003 DTE=11001110
BOTH/ASCII/ODD/ASYNC DCE=01100010
A.R.C. ASYNC TRAINING TA
INTERSHAKE Analyzes And Finds Your Da
ta Communications Problems Fast! 1234567
890 INTERSHAKE Analyzes And Finds Your
Data Communications Problems Fast! 12345
67890 INTERSHAKE Analyzes And Finds You
r Data Communications Problems Fast! 123
4567890 INTERSHAKE Analyzes And Finds

Figure 6-2

7 Other Applications

You can clear any individual trigger menu by displaying that menu and operating CONTROL plus CLEAR FIELD. You can clear all triggers by displaying the Trigger Summary and operating CONTROL plus CLEAR FIELD.

7.1 MEASURING TIME A LEAD IS ON

To measure the time that RLSD is ON, set a timer on one trigger to restart when RLSD is ON (1) and set another trigger to STOP the timer when RLSD goes OFF (0). (See Figure 7-1.) You can easily read each successive total on the results display (Figure 7-2) at the training tape data speed.

RTS ON time can be measured in a similar fashion.

7.2 COUNTING BLOCKS

To count the number of blocks received, including protocol blocks, set a counter to increment every time

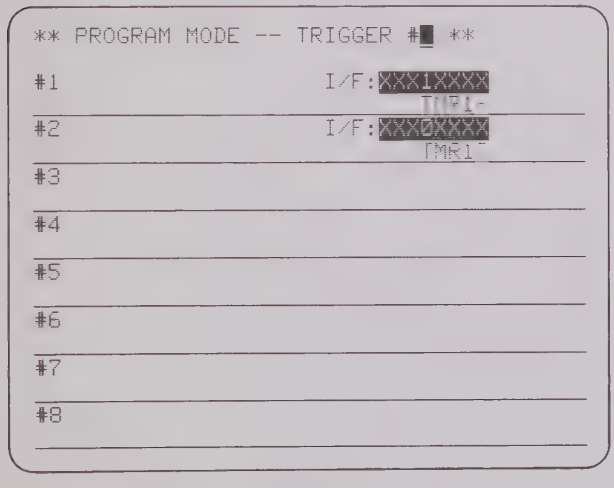

Figure 7-1

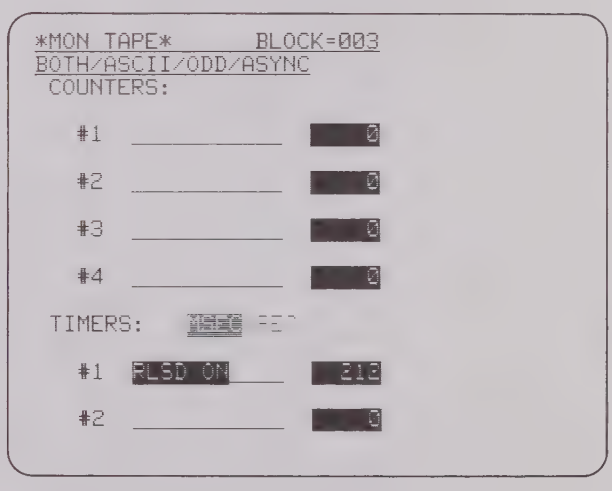

Figure 7-2

RLSD is raised. To count the number of blocks transmitted, set a counter to increment each time RTS is raised. (See Figure 7-3.)

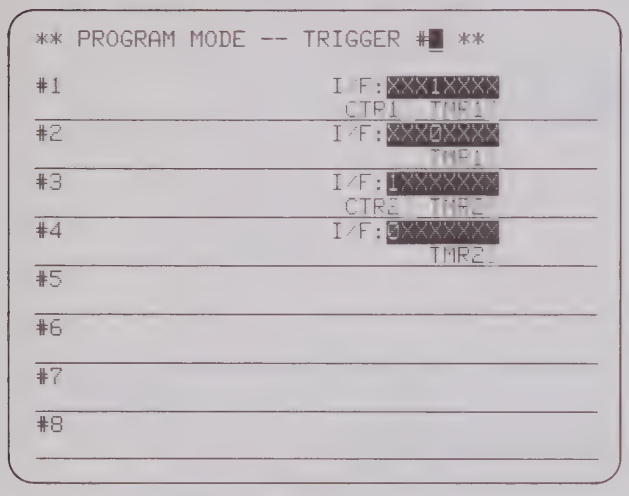

Figure 7-3

7.3 CALL LENGTH

To measure call length, set a timer to restart when DTR goes ON (1) and to STOP when DTR goes OFF (0). (See Figure 7-4.)

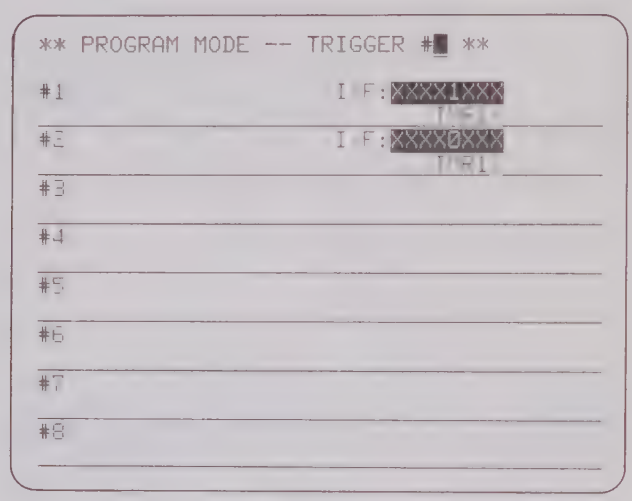

Figure 7-4

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Notice

This training manual is intended for use with Series B 3500 units of software level 3.04 and X.25-SDLC Training Tape TAP-895-104-1.3. Data recorded with any 3500 software may be played back in units of any software level. Recorded programs are "upward compatible"; that is, programs recorded with earlier software will load and run in a 3.04 unit, but programs saved in a 3.04 unit will not load into units with earlier software.

Atlantic Research Corporation reserves the right to make improvements to the product, manual and tape without prior notice. Further tape revisions, beyond 104-1.3, will not necessarily affect correlation with this manual.

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INTERVIEW 3500

1 Introduction

The INTERVIEW 3500 is not only a powerful, fully programmable monitor, but also an independently programmable data recorder. Its tape not only accommodates 4 million bits of data, but also stores the diagnostic test--including a complete set of program parameters-in a protected area. This training manual is based on the INTERVIEW 3500's X.25-SDLC Training Tape, 104-1.3.

If you are an INTERVIEW 3000 user, the numerous CRT display reproductions will enable you to use this basic course also. You should consult Appendix A first for suggestions on adapting the manual to your needs.

1.1 SCOPE OF MANUAL

This manual, in conjunction with the X.25-SDLC Training Tape, is intended to teach you to use the INTERVIEW 3500 in a bit-oriented protocol environment, including X.25, X.75, SDLC, HDLC, and BISYNC-framed X.25.* Since a self-teaching format is used, you should proceed through the manual in the given sequence. If you are familiar with the digital data communications world and bit-oriented protocols, then, using this manual and the training tape, you should be able to accomplish the following:

10-30 minutes: operate the 3500 and display bit-oriented protocol data.

1-2 hours: enhance data and use the network performance capabilities of an existing program.

2-3 hours: modify existing programs and conduct extemporaneous program diagnostics and performance measurements.

An extremely important consideration in any training activity is retention. With 3-4 hours' training from this manual and tape you can use the INTERVIEW 3500 effectively even after a "vacation" of 2-3 weeks because the logically and functionally labeled operations follow intuitively and there is no "instruction" set to memorize or look up.

*Throughout this manual the term BOP (Bit-Oriented Protocol) is used to include X.25, X.75, SDLC, and HDLC. Although BISYNC-framed X.25 is BOP in content, it uses synchronous framing and cannot be considered BOP for 3500 programming purposes.

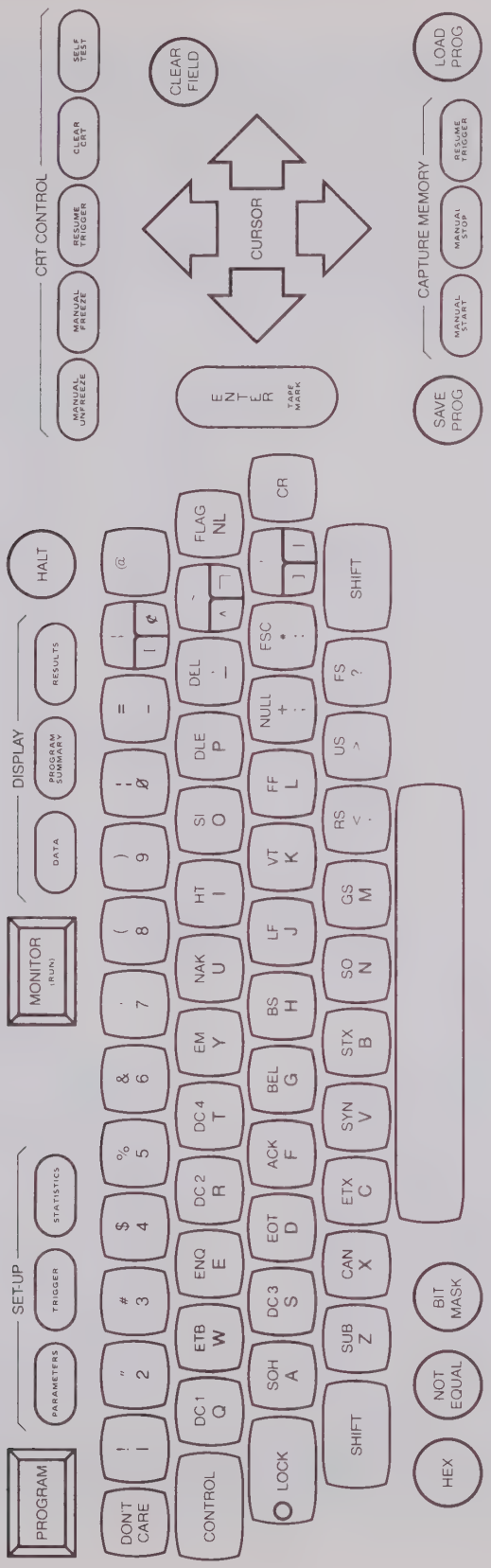

PROGRAM
SET-UP
PARAMETERS
TRIGGER
STATISTICS
MONITOR
(RUN)
DISPLAY
DATA
PROGRAM SUMMARY
RESULTS
HALT
CRT CONTROL
MANUAL UNFREEZE
MANUAL FREEZE
RESUME TRIGGER
CLEAR CRT
SELF TEST
CLEAR FIELD
CURSOR
ENTER
TAPE MARK
CAPTURE MEMORY
MANUAL START
MANUAL STOP
RESUME TRIGGER
SAVE PROG
LOAD PROG
HEX
NOT EQUAL
BIT MASK
DON'T CARE
CONTROL
LOCK
SHIFT
SHIFT
CR
FLAG NL
DEL
ESC
NULL
FS
US
RS
GS
FF
SI
HT
NAK
EM
BS
BEL
DC 4
DC 2
ENQ
ETB
DC 1
SOH
SUB
CAN
ETX
SYN
STX
SO
LF
VT
DLE
DC 3
EOT
ACK

Figure 1-1

Consult the Technical Manual, ATLC-107-895-101, for specifications and details of 3500 (or 3000) operation. Use other reference documents for in-depth treatment of specific protocols and interface standards.

The remainder of Section 1 presents a general nonoperating overview of the INTERVIEW 3500. You will become familiar with the major operational controls and indicators. Beginning with Section 2, you will use the instrument in various operational modes.

Figures show typical CRT displays. Negative reproductions of displays have been used because they offer better definition in print than do positives. The tape block numbers may vary between the training tape and figures in this manual because of operator response time; however, the content of each figure will still illustrate the point.

1.2 HUMAN INTERFACE

You interact with the 3500 via the keyboard and the 7-inch CRT display. Each control key is clearly labeled by function.

With only a glance at the two status lines on the CRT and the status indicator zone of the front panel you will quickly understand what mode the 3500 is in, what it is doing, and why. An audible beeper confirms proper key operation and calls attention to illegal key actions.

1.3 KEYBOARD

Familiarize yourself with the color-coded, touch-sensitive keyboard (see Figure 1-1). Notice especially the following significant features:

- Full ASCII typewriter-terminal keyboard layout.
- Blue keys are those used for HEX (and the most often used protocol control characters).
- Red keys are used primarily in the Program Mode.
- Green keys are used in the Monitor Mode and are grouped in three zones for --

  Display selections,
  CRT control,
  CAPTURE MEMORY (tape) control.

- Rectangular Red and Green keys are the mode entry keys:

PROGRAM = RED; MONITOR = GREEN.

- A special FLAG key is used for the Flag byte in HDLC (bit stuffing) framing. (An HDLC Flag cannot be entered using HEX 7 E.)

Notes:

1. Some keys repeat when held down (e.g., cursor arrows).
2. The CONTROL key must be held down while a key for a protocol control character is operated.
3. Some keys are alternate action (e.g., CRT SELF TEST and, in Monitor Mode, HEX).
4. Some keys are single function latch (e.g., HEX accepts the next two keys as HEX in Program Mode).
5. Refer to the Technical Manual for full key specifications.

1.4 INDICATOR PANEL

The right STATUS indicator zone of the front panel clearly identifies the CRT display and tape activity (Figure 1-2). A FREEZE indicator quickly

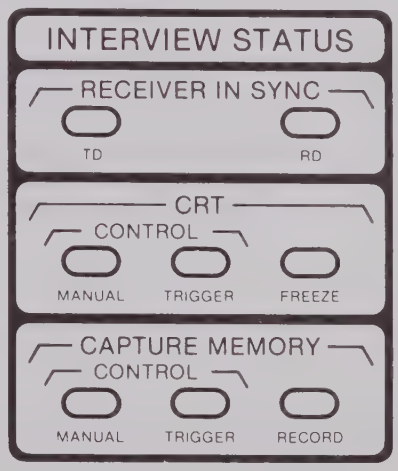


Figure 1-2

verifies that the CRT display is supposed to be frozen and whether the cause is a manual request by the operator or action by a program trigger. A RECORD indicator verifies that the tape is recording at the direction of the operator manually or via a program trigger.

The left STATUS zone of the front panel provides additional functionally labeled indicators for the RS-232/V.24 interface signals (Figure 1-3).

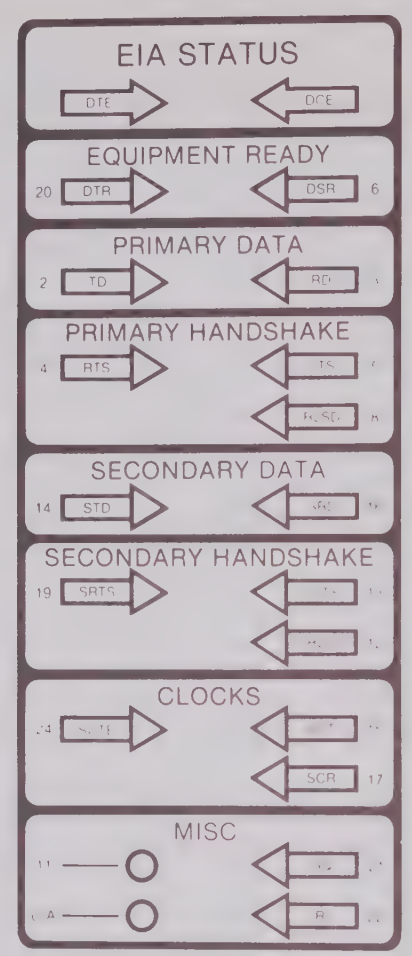


Figure 1-3

1.5 CRT DISPLAY

The top two lines of the CRT display are reserved for status information for the operator. Sixteen lines are provided for data display and program menus. Each line contains 40 characters for a total data display of 640 characters.

A buffer holds three displays of data (1920 characters). The CRT window of 640 characters can be scrolled through this buffer line by line.

1.6 PROGRAMMING CONCEPT

A unique nonsequential programming concept makes it unnecessary to learn programming. Terms such as addresses, steps, jumps, interrupts, conditional tests, and macro instructions are not used at all because a simpler and more powerful method is provided.

Basically, you define a situation you want to look for and what action (or actions) should then be set. This capability is called a trigger. Eight triggers are available. All eight triggers can look for independent non-related conditions (e.g., character strings) simultaneously and can take independent and (or) interrelated actions (counters, timers, CRT control, tape control, and so on).

You simply indicate what the 3500 is to do. No sequential program steps or flow charts are required and there is no list of instructions or commands to remember.

2 Power-up

2.1 WITHOUT TAPE INSERTED

(1) Operate the red power switch. The CRT will show the display of Figure 2-1. If an error is found during the power-up interactive diagnostics among the internal microprocessors, a code indicative of the defective subassembly will be displayed in the SELF TEST line. Refer to the Technical Manual for a list of the error codes.

You may now use only the PROGRAM key or the MONITOR key. Any other key will cause a KEY ERROR response on line 2 of the display and an audible signal. KEY ERROR clears after 3 seconds or when a correct key is operated.

(2) Verify the KEY ERROR response by operating a numeric key.

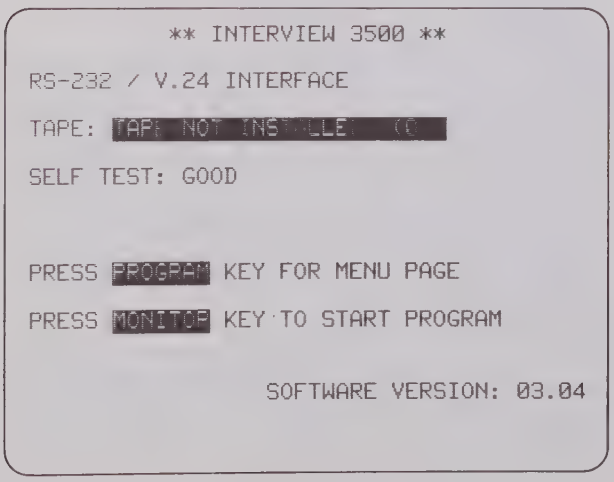


Figure 2-1

NOTE: On power-up without tape inserted, the program defaults to basic BISYNC parameters.

(3) Operate the MONITOR key and observe the display (Figure 2-2). On the top line are the mode, MONitor, signal source, LINE, and the tape BLOCK number. The second line shows that the monitor is expecting signals on BOTH the DCE and DTE circuits and that the signals should be EBCDIC and SYNChronous, with synchronization characters of 32 32_{16}.

If a BISYNC signal were to be applied to the rear RS-232/V.24 connector, the data would now be displayed.

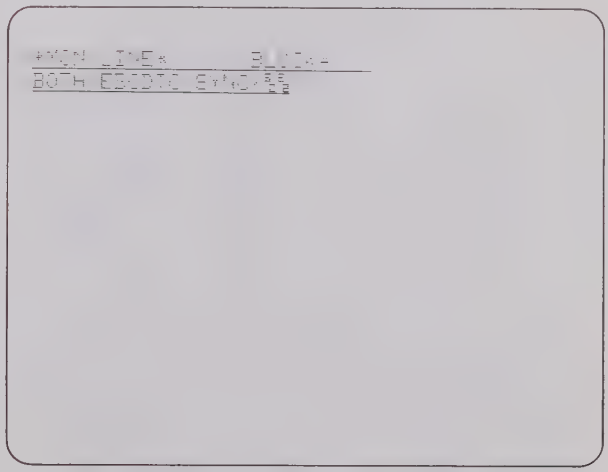


Figure 2-2

(4) Operate the PROGRAM key and observe the display (Figure 2-3).

NOTE: You may use the PROGRAM key at any time in any mode to provide a known basic starting point.

Notice that the Program Selections menu permits only six selections. All programming is accomplished through the Parameters, Triggers, and Statistics menus, which are thoroughly explained in this manual.

The bottom two selections permit you to SAVE a program on tape or LOAD a taped program.

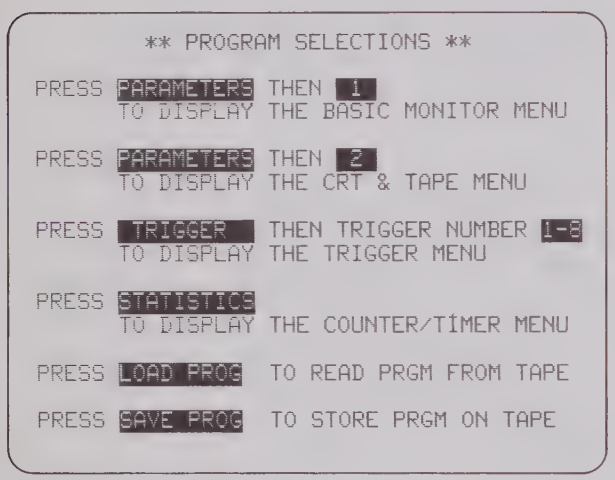

** PROGRAM SELECTIONS **
PRESS PARAMETERS THEN 1
TO DISPLAY THE BASIC MONITOR MENU
PRESS PARAMETERS THEN 2
TO DISPLAY THE CRT & TAPE MENU
PRESS TRIGGER THEN TRIGGER NUMBER 1-8
TO DISPLAY THE TRIGGER MENU
PRESS STATISTICS
TO DISPLAY THE COUNTER/TIMER MENU
PRESS LOAD PROG TO READ PRGM FROM TAPE
PRESS SAVE PROG TO STORE PRGM ON TAPE

Figure 2-3

2.2 TAPE INSERTED AFTER POWER-UP

(1) Check that the RECORD tab on the rear of the tape cartridge is not in the record position (the tab should be toward the center of the cartridge). Insert the X.25-SDLC training tape with the drive wheel to the rear and the transparent window on top. Push it gently in until you feel it lock.

NOTE: The training tape may be supplied with the record tab removed entirely to prevent accidental erasing of its content. Nevertheless, you should develop the habit of checking the tab whenever you use any tape.

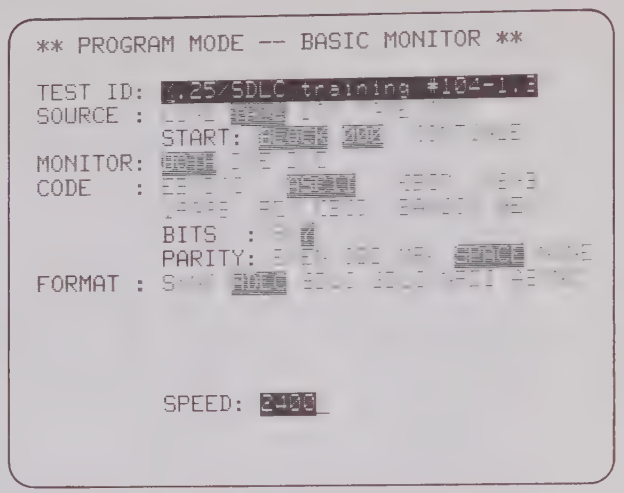


Figure 2-4

(2) Operate the PROGRAM key.

(3) Press the LOAD PROGram key to the right of the CAPTURE MEMORY zone. The microprocessor that controls the tape will automatically reposition the tape to the program area, read the program, and reposition the tape to Block 000 for playback.

Observe the display (Figure 2-4). The TEST ID is X.25/SDLC TRAINING followed by an issue number. The other parameters on this menu will be discussed in later sections.

(4) Operate the MONITOR key. After the tape automatically positions itself, data is displayed (Figure 2-5). The top two lines indicate we are MONitoring the TAPE at BLOCK XXX as a

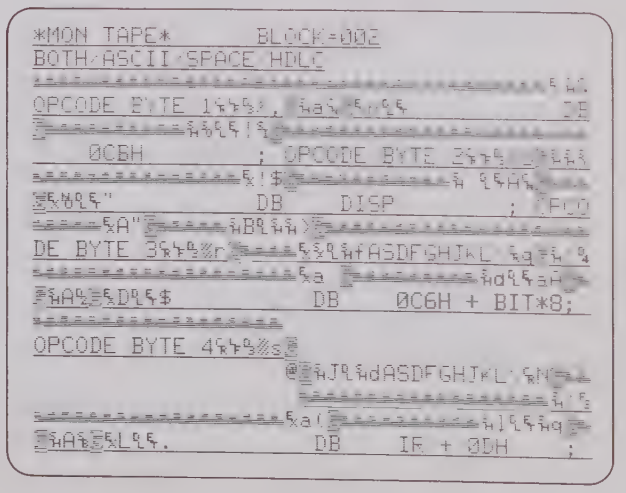


Figure 2-5

source for signals on BOTH the DTE and DCE lines using ASCII code with SPACE parity in HDLC format.

Operate the PROGRAM key to stop the tape and then power down the 3500 with the red alternate-action power button. Leave the tape inserted.

2.3 POWER-UP WITH TAPE INSERTED

(1) Insert the training tape; then power up the 3500. The tape is automatically searched for a test program in its protected location after the internal self tests are complete. The test is automatically loaded and the power-up menu with the TEST ID displayed as shown in Figure 2-6.

(2) Operate the MONITOR key. Data from the tape is now displayed on the CRT.

(3) Stop the tape by operating PROGRAM before you turn off the power.

2.4 REVIEW

• To use a tape containing a previously saved test that has already been inserted in the 3500, only two keys are required: Power-up and MONITOR.

```
** INTERVIEW 3500 **
RS-232 / V.24 INTERFACE
TAPE: X.25/SDLC training #104-1.3
SELF TEST: GOOD

PRESS PROGRAM KEY FOR MENU PAGE
PRESS MONITOR KEY TO START PROGRAM

                SOFTWARE VERSION: 03.04
```

Figure 2-6

• To insert a saved program tape after power-up--

1. Insert the tape.
2. Operate the PROGRAM key.
3. Operate LOAD PROGram.
4. Operate MONITOR.

NOTE: Always stop tape motion by pressing the red PROGRAM key before you operate the Power button to power down the 3500. Never eject a tape until after tape motion has stopped.

3 Monitor Mode

3.1 INTRODUCTION

The training tape contains three types of data:

1. HDLC-framed X.25 (Blocks 000 to 070)
2. BISYNC-framed X.25 (Blocks 080 to 095)
3. SDLC-SNA (Blocks 150 to 250)

HDLC-framed X.25 will be used as a general case. BISYNC-framed X.25 and SDLC will be specifically addressed in Sections 5 and 6, respectively.

Appendix B contains a brief overview of the construction of Bit-Oriented Protocols. Appendix C lists the acronyms displayed by the 3500 for bit-oriented protocols. You may prefer to read these Appendixes before proceeding through the manual. For a thorough review, consult the applicable documentation of CCITT for X.25 and X.75 and that of IBM for SDLC-SNA.

By programming the 3500, you can perform extensive diagnostics on the data. You can save your programs on additional tapes for future on line use. The diagnostic applications you will be able to perform after using this manual include the following:

DISPLAY:

- Readable expansion of frame command bytes and packet definition including LCN numbers and Q, D, M bit status
- Suppress all idle Flag characters to increase the efficiency of the display
- Display only information frames
- Display only information packets
- Display only packets to a given LCN
- Force hexadecimal presentation of command bytes
- Suppress the content of information frames or packets to condense the display or maintain security
- Highlight specific types of frames or packets
- Freeze CRT to capture cause of fault
- Record only specific LCN packets

MEASUREMENTS:

- Packet size
- Protocol efficiency
- Line utilization
- Q, D, M bit activity
- Error recovery, e.g., count resets, SARM, DISC.
- FCS errors
- Elapsed call time

3.2 DATA, REAL TIME

With the tape installed, power up the 3500 and press the green rectangular MONITOR key to put the unit in Monitor Mode. This key enables all the green keys on the keyboard and also permits a number of other keys to be used for special functions available only in Monitor Mode.

As you go through this section you will be working with the data on the training tape. Remember that there are three types of data on the tape (see Section 3.1).

Since the training tape program applies only to Blocks 000-070, you will need to rewind the training tape

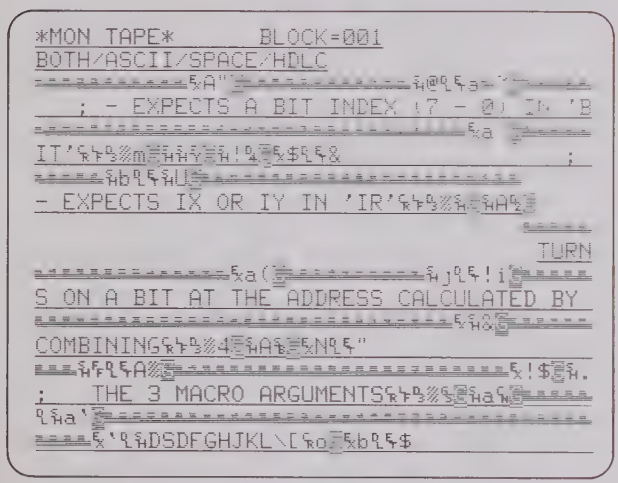

MON TAPE BLOCK=001
BOTH/ASCII/SPACE/HDLC
; - EXPECTS A BIT INDEX (7 - 0) IN 'B
IT'
- EXPECTS IX OR IY IN 'IR'
TURN
S ON A BIT AT THE ADDRESS CALCULATED BY
COMBINING
; THE 3 MACRO ARGUMENTS

Figure 3-1

when it reaches Block 070. When the tape plays past Block 070, no new data will be added. When this occurs, press PROGRAM, then MONITOR, to automatically rewind the tape to Block 000 before playback resumes. Do this now and observe the display.

Notice that in the training tape program, the idle Flag bytes between frames are suppressed (Figure 3-1; compare this display with Figure 3-2). This accounts for the pauses in writing the display.

Observe that in HDLC framing the 3500 display replaces the second frame check byte (FCS 2) with an indicator

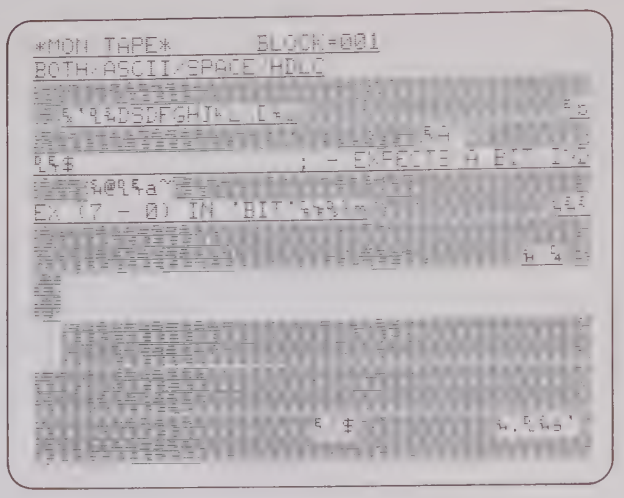


Figure 3-2

letter for the frame (see Figure 3-3). These reversed letters, G for Good and B for Bad, provide clear demarcation between frames as well as immediately highlighting problems. Aborted frames are identified by the reverse letter A. Since good blocks are normal, the G is low intensity, while the B and A are bright to catch your eye.

In Program Mode, up to eight other characters may be selected for blinking reverse-image display.

Notice the time-correlated, dual-line display of the full-duplex data. The first line is always DTE data; and the second, DCE. The DCE data is

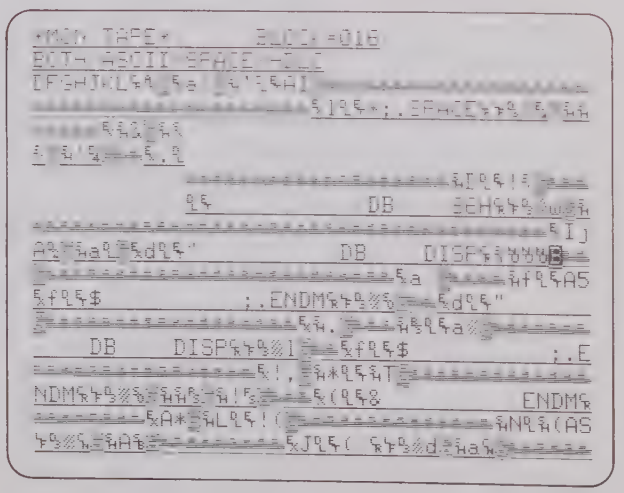


Figure 3-3

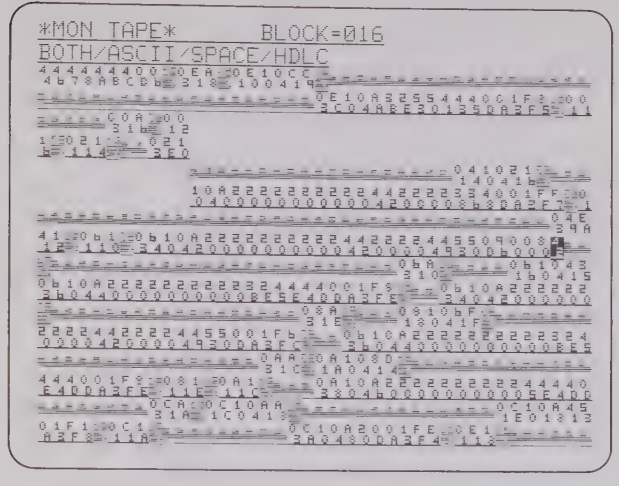


Figure 3-4

always underlined because the DCE is usually connected to the transmission line.

Operate the HEX key and observe that the entire display (except the status lines) is now in hexadecimal, as shown in Figure 3-4.

Operate the HEX key again to restore text.

In HDLC framing, protocol characters such as STX, SOH, or ETX are not relevant. They should be displayed in hexadecimal because their true significance usually lies in their bit patterns. Operate CONTROL plus HEX simultaneously and observe that only ASCII control characters change to hexadecimal and the text remains (as in Figure 3-5). Operate CONTROL plus HEX again to restore all text. HEX and CONTROL plus HEX are alternate action operations.

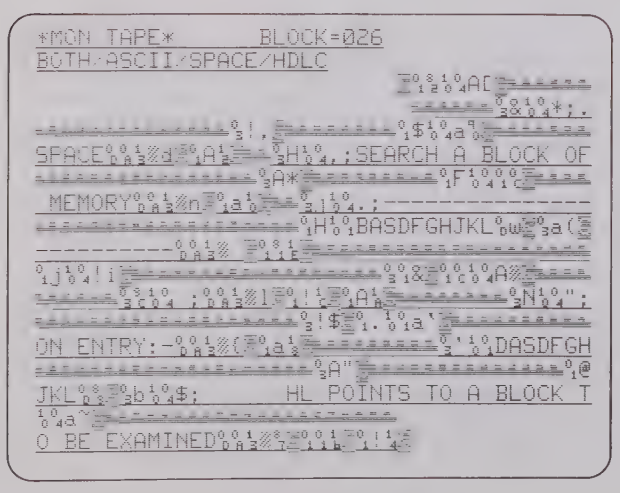


Figure 3-5

The speed of the CRT display is 2400 bps as defined by the program on the training tape. To speed up the display, operate the UP cursor arrow. In Monitor Mode, each operation of the UP cursor key doubles the playback speed to a maximum of 9.6 kbps. (The tape will record data at 19.2 kbps.)

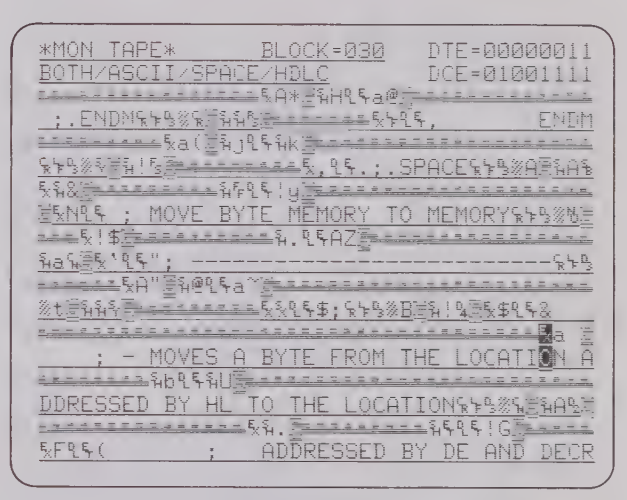


Figure 3-6

Each operation of the DOWN cursor halves the playback speed.

3.3 DATA, MANUAL FREEZE

Operate the MANUAL FREEZE key in the CRT control zone to obtain a display similar to Figure 3-6.

Notice that the two lines that were blanked when the display was running real time have restored their data to give a full 640-character display. The blinking cursor is on the last character (or two characters in dual-line display) received.

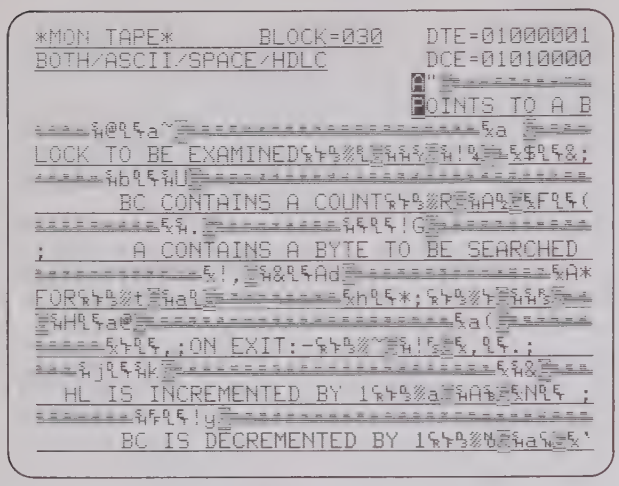

MON TAPE BLOCK=030 DTE=01000001
BOTH/ASCII/SPACE/HDLC DCE=01010000
POINTS TO A B
LOCK TO BE EXAMINED
BC CONTAINS A COUNT
A CONTAINS A BYTE TO BE SEARCHED
FOR
HL IS INCREMENTED BY 1
BC IS DECREMENTED BY 1

Figure 3-7

Operate the B key to display the Beginning of the buffer (Figure 3-7 is typical) and then the E key for the End of the buffer (Figure 3-8 is typical). Intermediate positioning of the 640-character CRT window in the 1920-character buffer is accomplished by holding the UP or DOWN cursor key until, after the cursor reaches the top or bottom of the CRT, the next line is pulled onto the screen.

Notice that the RIGHT and LEFT cursor keys also position the cursor (blinking characters) and it "wraps" around from the end (or beginning) of one dual line to the beginning (or end) of the next. This is a valuable time-saving feature.

At the right side of the top two lines are displayed DCE and DTE with 1-0 patterns representing the binary patterns of the characters at the cursor position. Bit 1, the low-order bit and first bit in the serial stream, is the rightmost bit on the screen. This permits you to read the hexadecimal equivalent directly from the bit pattern.

NOTE: We have observed this convention throughout the 3500 display and documentation. This is an important point, as there is much inconsistency in the order in which bit patterns are printed in the industry's literature.

The MANUAL and FREEZE LEDs on the indicator panel are ON.

Also notice that the block number of the tape remains displayed. In playback mode only, the tape stops when MANUAL FREEZE of the CRT is operated. MANUAL STOP of the CAPTURE MEMORY also stops the tape and thus freezes the display in the same manner.

HEX and CONTROL plus HEX also work in freeze.

Operate CLEAR CRT in the CRT CONTROL zone to clear the display of old data (the buffer is also cleared).

Operate RESUME TRIGGER to again display real-time data.

3.4 ACRONYM EXPANSION:FRAME and PACKET

The cursor can be "tabbed" through the display to automatically locate each frame control byte or packet-type byte. When the cursor comes to rest on one of these bytes a bit analysis is performed on it and the CRT displays the acronyms and other associated protocol information. The frame-control and packet-type byte expansions that can be displayed by the F and P keys are given in Appendix C.

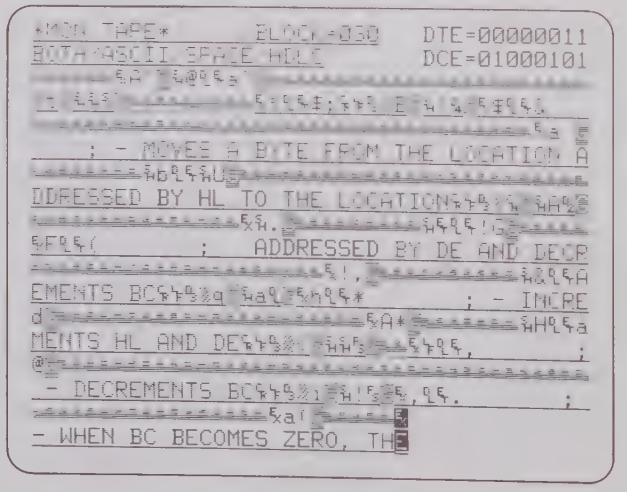

MON TAPE BLOCK=030 DTE=00000011
DCE=01000101
; - MOVES A BYTE FROM THE LOCATION A
DDRESSED BY HL TO THE LOCATION
; ADDRESSED BY DE AND DECR
EMENTS BC
; - INCRE
MENTS HL AND DE
- DECREMENTS BC
- WHEN BC BECOMES ZERO, TH

Figure 3-8

To obtain expansions of frame control bytes:

(1) Operate FREEZE, then the "B" key to position the cursor at the beginning of the display buffer.

(2) To make interpretation easier, use CONTROL plus HEX to display all control bytes in hexadecimal.

(3) Operate the "F" key to locate the first frame control byte on the display after the cursor. Figure 3-9 is typical.

(4) Observe that line 2 contains the expansion of the frame-control byte.

(5) Continue to operate the F key to tab through the display. When the cursor is at the bottom of the CRT the next line(s) will be scrolled onto the CRT from the display buffer. When the cursor reaches the end of the buffer, CONTROL BYTE NOT FOUND will be displayed.

To display expansions of packet-type octets:

(1) Operate the B key.

(2) Operate the P key to locate the first packet-type octet. Figure 3-10 is typical.

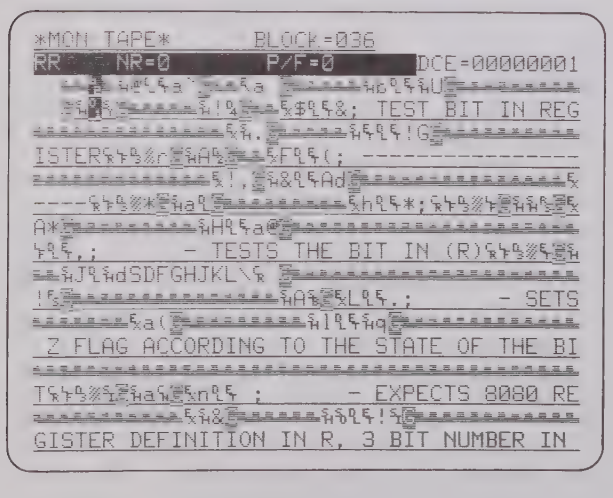

MON TAPE BLOCK=036
NR=0 P/F=0 DCE=00000001
TEST BIT IN REG
TESTS THE BIT IN (R)
SETS
Z FLAG ACCORDING TO THE STATE OF THE BI
EXPECTS 8080 RE
GISTER DEFINITION IN R, 3 BIT NUMBER IN

Figure 3-9

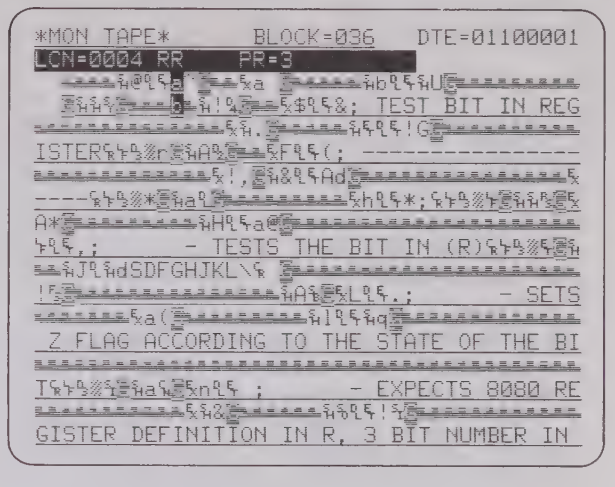

MON TAPE BLOCK=036 DTE=01100001
LCN=0004 RR PR=3
TEST BIT IN REG
TESTS THE BIT IN (R)
SETS
Z FLAG ACCORDING TO THE STATE OF THE BI
EXPECTS 8080 RE
GISTER DEFINITION IN R, 3 BIT NUMBER IN

Figure 3-10

(3) Line 2 contains the expansion of Octets 1 and 2 as well as the packet-type octet (Octet 3). The logical channel number is displayed as a decimal number, and if the Q, D, and M bits are 1, the appropriate characters are displayed.

(4) If you continue using the P key to the end of the buffer, CONTROL BYTE NOT FOUND will be displayed.

Alternate use of the F and P keys will move the cursor back and forth between the frame-control byte and packet-type octet of one frame until one of the two keys is operated twice in succession.

Notice that although the cursor points to both a DTE and a DCE character simultaneously, you can identify which character the F or P key has expanded by which binary breakdown appears at the upper right-hand corner of the screen.

You may obtain a mnemonic frame or packet expansion for any character on the screen by positioning the cursor at the desired byte and pressing CONTROL plus F or CONTROL plus P. Remember, though, that in this case the logic cannot distinguish between a genuine frame-control byte or packet-type octet and the numerous invalid possibilities.

3.5 RESULTS, REAL TIME

Operate PROGRAM, then MONITOR, to rewind the tape to Block 000. While data is being displayed, operate the RESULTS key in the DISPLAY zone to obtain the display of Figure 3-11. The two status lines at the top remain and the tape block number is still incrementing.

Observe that the four counters and two timers are clearly named to show their functions in the training tape program. The counters will be counting almost continuously, depending on what data is read from the current block of the tape.

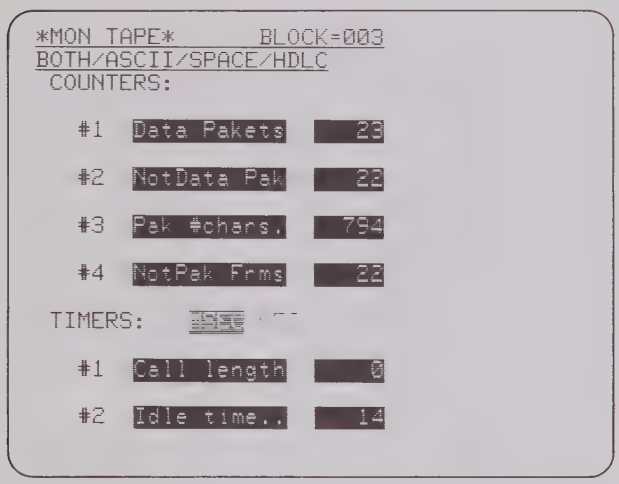


Figure 3-11

Press the DATA key and notice that data is still being monitored.

Return to RESULTS.

Notice the value of the Not Pak Frms counter; operate the C and then the 4 key to reset Counter 4 to zero. Any counter can be reset with C followed by its number or any timer by T followed by its number. The R key resets all counters and timers. Operate MANUAL FREEZE and observe that the counter accumulations stop, because the tape playback stops. Press RESUME TRIGGER and observe that the counters and timers resume counting, without resetting.

Results can be easily modified while a test is running to enable you to look for several criteria at the same time without going back into the Program Mode.

With Results displayed, operate the MONITOR key and notice that all counters and timers reset. MONITOR, used when the unit is already in Monitor Mode, restarts the entire test, without initializing the tape.

Both timers increment in milliseconds or seconds as indicated on the display.

Maximum count is 65,535 for counters and timers. Overflow is indicated by a message to the right of the counter or timer.

> NOTE: All data received by the 3500 is presented to the counters and timers whether or not the data or portions of it are displayed on the CRT or recorded onto tape.

3.6 PROGRAM SUMMARY

While you are viewing data and results, you may wish to review the program. The 3500 allows you to see the program without leaving Monitor Mode. It presents a Program Summary in an easy-to-understand format that requires no complex instruction listings or flow charts.

3.6.1 Perhaps you would like to know how Counter 1 on the Results display has been programmed to count Data Packets. Data packets are defined by the fifth byte (Octet 3) having Bit 1 = 0.

Operate the PROGRAM SUMMARY key in the Display zone. The program will be displayed as in Figure 3-12. Find CTR 1 in the Trigger #1 area. The summary shows that Trigger #1 looks at the DCE line for a sequence of Flag (shown as hexadecimal reverse-image 7E), any byte not equal to Flag (reverse-image 7E with a bar through it), three Don t Care bytes (reverse-image DC), and a bit mask (reverse-image M). The byte not equal to Flag represents the address byte and defines the preceding

Flag as the opening Flag; the three Don't Care bytes are the frame-control byte and the first two packet octets; and the bit mask represents the unique bit pattern of a packet-type octet (Octet 3). In Program Mode, the Trigger #1 menu would show the specific pattern of the bit mask to be XXXX XXX0.

CRT1I means that Counter 1 is set to Increment upon receipt of the above string.

3.6.2 Operate the RESULTS key. Notice that Timer 2 is actively increasing. It indicates elapsed idle time for comparison with Call time.

Display the Program Summary again. Notice the entry under Trigger #2. A DCE string consisting of a byte Not Equal to Flag followed by Flag identifies the ending Flag. TMR2C means that Timer 2 Continues when the ending Flag is detected by Trigger #2.

Under Trigger #8 you can see that Timer 2 stops when the leading flag is detected. The leading flag is specified by the DCE sequence Flag, Not Equal Flag.

Once you have read the sections on programming, you will find the Program Summary easy to interpret and a valuable timesaver.

3.6.3 Return to Results. The counters, timers, and block numbers will have changed because the program has been running while the Program Summary has been displayed.

3.6.4 Press PROGRAM to stop the tape; then press the red power button to power down the 3500.

3.7 MONITOR REVIEW

In Monitor Mode, without stopping the test or interrupting the recording of data onto tape, you may review the Program Summary or Results, reset the counters or timers or both, and manually freeze or unfreeze the display and return the CRT to trigger control.

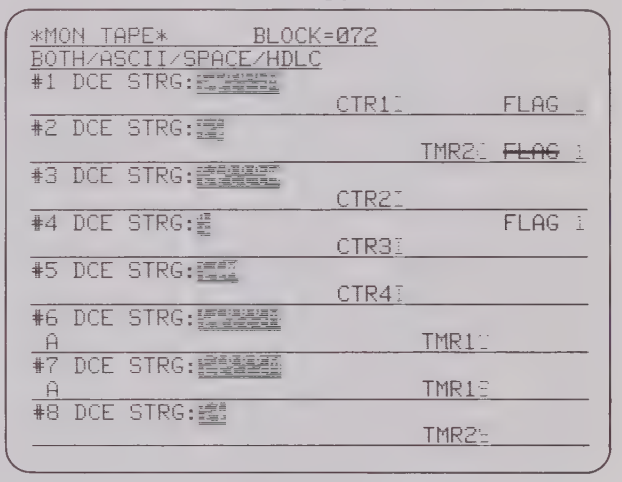


Figure 3-12

This capability substantially increases efficiency, especially in time-critical situations.

4 Program Mode: X.25 Applications

Pressing the red rectangular PROGRAM key enables all the red Program Mode keys and allows full use of the typewriter keyboard. The PROGRAM key also initializes all circuits, counters, and timers, and stops tape motion.

4.1 PACKET DIAGNOSTIC DISPLAY

In a packet network, many of the transmissions on a communcations link are only for the purpose of network supervision or communication error control. One link may carry many packet channels.

Often the first task in analyzing a problem is to visually display the information that is specifically of interest. This section will lead you step by step to a clear display of all information packets on a specific logical channel without supervisory or error control material.

4.1.1 Basic Monitor Mode Menu. To give you experience in programming the 3500, we will not use the training tape program here, but you will need the tape as the data source.

(1) Power-up the 3500 without the tape (as in Section 2.1).
(2) Press PROGRAM to place the unit in Program Mode.
(3) Operate the red PARAMETERS key and then the numeral 1.

The Basic Monitor menu shown in Figure 4-1 will be displayed.

The bright reverse-image blinking cursor is in the TEST ID field. Here you may enter a program title of up to 27 alphanumeric or control characters (spaces count). We have titled the first program PACKET DIAGNOSTIC DISPLAY. Use the LOCK to lock in SHIFT; then type in the title. Press SHIFT to release the LOCK.

To move the cursor to the SOURCE field, press ENTER. The cursor will move to the default selection, LINE. Press the right cursor arrow to move the cursor to TAPE. This not only selects TAPE as the data SOURCE, but also automatically displays a START field on

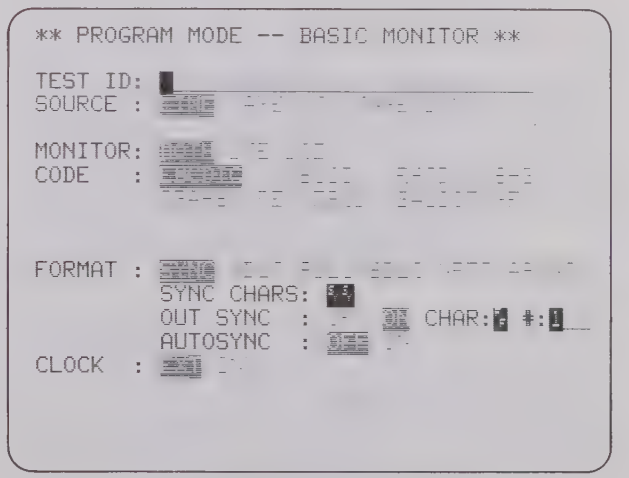


Figure 4-1

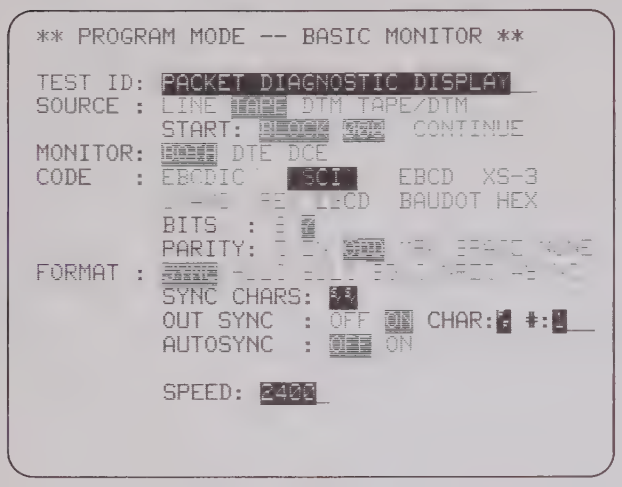

** PROGRAM MODE -- BASIC MONITOR **
TEST ID: PACKET DIAGNOSTIC DISPLAY
SOURCE : LINE TAPE DTM TAPE/DTM
START: BLOCK 000 CONTINUE
MONITOR: BOTH DTE DCE
CODE : EBCDIC ASCII EBCD XS-3
BAUDOT HEX
BITS : 7 8
PARITY: SPACE MARK EVEN ODD NONE
FORMAT : SYNC HDLC BISYNC BSC ASCII
SYNC CHARS: 16
OUT SYNC : OFF ON CHAR: 16 #: 1
AUTOSYNC : OFF ON
SPEED: 2400

Figure 4-2

the next line and a SPEED selection field on the last line.

Notice that if you try to use the RIGHT cursor arrow to leave the SOURCE field, the selection will change. To be sure that you do not alter your selection, always use the ENTER key to move the cursor directly to the next field. If you move the cursor too far down, you may move it back up with the UP cursor arrow.

Use ENTER to position the cursor at BLOCK 000 in the START field. Since the X.25 data on the training tape runs from Block 000 through 070, this default selection is the one we want.

Notice that the default selection for MONITOR is BOTH DTE and DCE. Since

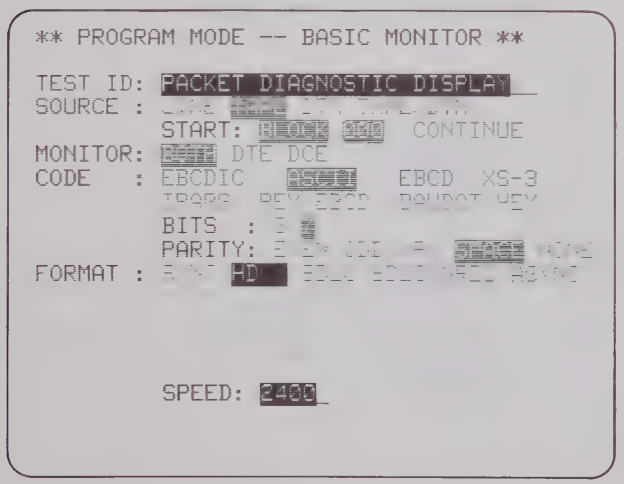

** PROGRAM MODE -- BASIC MONITOR **
TEST ID: PACKET DIAGNOSTIC DISPLAY
SOURCE : LINE TAPE DTM TAPE/DTM
START: BLOCK 000 CONTINUE
MONITOR: BOTH DTE DCE
CODE : EBCDIC ASCII EBCD XS-3
BAUDOT HEX
BITS : 7 8
PARITY: SPACE MARK EVEN ODD NONE
FORMAT : SYNC HDLC BISYNC BSC ASCII
SPEED: 2400

Figure 4-3

this is the selection we want, we can tab directly to the CODE line by using the ENTER key twice. The ENTER key never alters a selection.

The training tape data that we intend to monitor is ASCII with seven information bits. Use a cursor arrow to select ASCII. Two new fields now appear, BITS and PARITY. (Compare Figure 4-2 with Figure 4-1.)

The default selection in the BITS field is 7, so you can use ENTER to tab directly to the PARITY field. In the training tape data, the eighth bit (parity bit) is space rather than parity. (This is the case with most

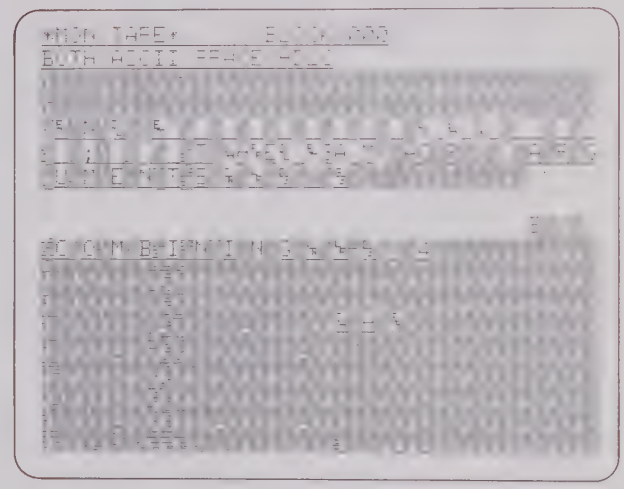


Figure 4-4

DEC equipment, for example.) In the PARITY field, select SPACE.

Now go to the FORMAT field. The default format selection is SYNC. Move the cursor to the right to select HDLC and notice that all the options under FORMAT disappear because they are not applicable to monitoring Bit-Oriented Protocols.

The last line is the value for SPEED, which was automatically entered when you selected TAPE. The default value is 2400.

Your Basic Monitor menu should now appear as in Figure 4-3. You have now

selected all the parameters necessary to monitor data from the training tape.

4.1.2 CRT Control. Insert the X.25-SDLC training tape. Press MONITOR. The microprocessor that controls the tape will automatically reposition the tape to Block 000, as you have specified on the Basic Monitor menu, and begin playback. As Figure 4-4 shows, the display is single-line, with DCE data distinguished by the underline. No data is suppressed: all the idle Flags (low-intensity reverse 7E) are displayed. There are no other highlights because none have been programmed.

Press PROGRAM; then PARAMETERS and 2, to display the menu shown in Figure 4-5. We shall be concerned with the CRT CONTROL portion of the menu.

Move the cursor from SINGLE line (the default selection) to DUAL line. Press MONITOR. Again the tape playback will begin from Block 000. The data will now appear in time-correlated dual-line display as shown in Figure 4-6.

Since the idle Flags take up most of the display space, we shall suppress them, as was done on the Training Tape Program.

Return to the CRT CONTROL menu (PROGRAM, PARAMETERS, 2). The cursor is in the DISPLAY MODE field. Move the cursor to the SUPPRESS field.

The SUPPRESS field is a data entry field; that is, you may choose up to eight characters to be suppressed and enter them directly from the keyboard. To suppress idle Flags, press CONTROL plus the FLAG key simultaneously. A low-intensity 7E appears.

NOTE: A low-intensity entry in a data entry field always signifies that the symbol represents something other than itself.

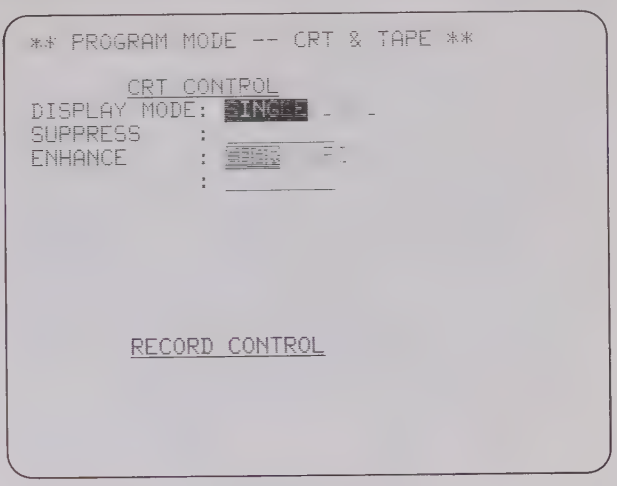


Figure 4-5

In this case, it means that a Flag is intended, and the logic will treat it as a Flag, rather than a data $7E_{16}$.

If you make an error in a data entry field, you may write over it. You may clear the remainder of a field starting with the cursor position by pressing SHIFT plus CLEAR FIELD. CLEAR FIELD clears an entire field. CONTROL plus CLEAR FIELD clears an entire menu to default condition and thus should be used cautiously.

MONITOR the taped data and notice how much more compact the display is

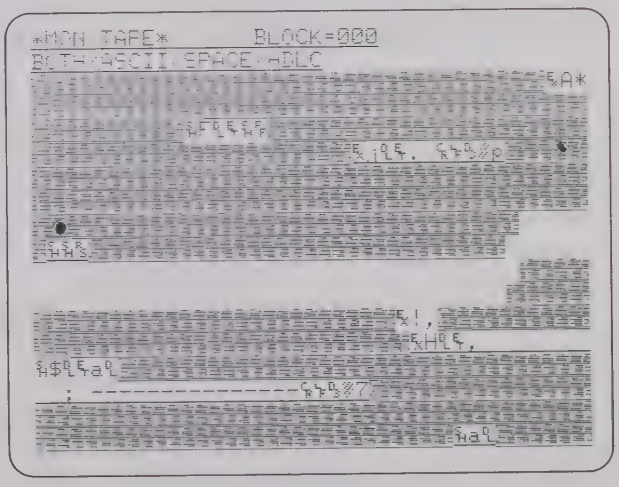


Figure 4-6

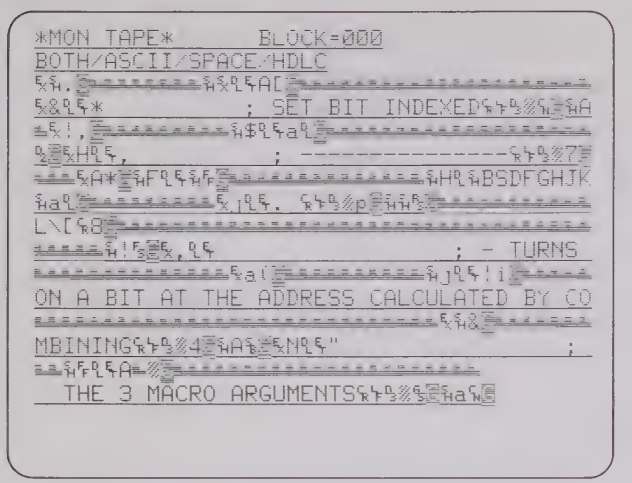


Figure 4-7

(Figure 4-7) with the idle Flags suppressed. Frames still can be distinguished by the good (G), bad (B), and abort (A) symbols.

You may wish to verify that if you enter HEX, 7, E in the SUPPRESS field, Flags will not be suppressed.

4.1.3 Triggers. Using the triggers, the CRT can be unfrozen and refrozen so that only data of interest is added to the display.

Operate PROGRAM; then TRIGGER. Notice that the display (Figure 4-8) is similar to that given by the PROGRAM SUMMARY key in Monitor Mode (Figure 3-12). There are eight triggers.

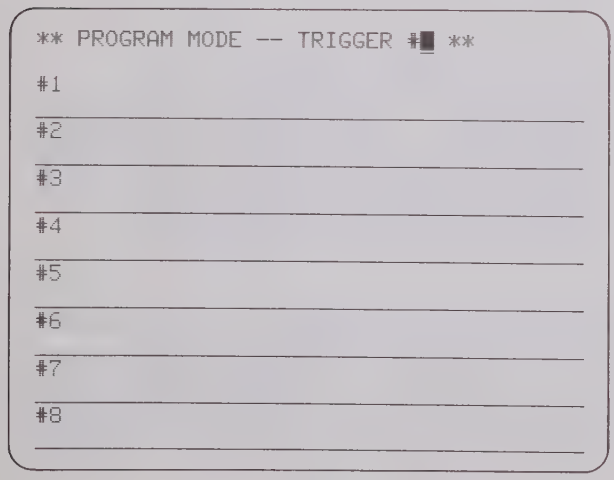


Figure 4-8

Press the numeral 1. This displays the menu for Trigger 1 (Figure 4-9). A horizontal line divides the top MONitor characteristics that the trigger will LOOK FOR from the bottom SET actions that it will take. If you compare this with Figure 3-12, you will see the significance of the upper and lower lines for each trigger on the Program Summary.

There are three monitor conditions that the triggers will look for: (1) data characters; (2) interface lead status; and (3) internal flags. When all of the selected conditions are true, the trigger will take as many of the following actions as have been selected: (1) set CRT; (2) set tape;

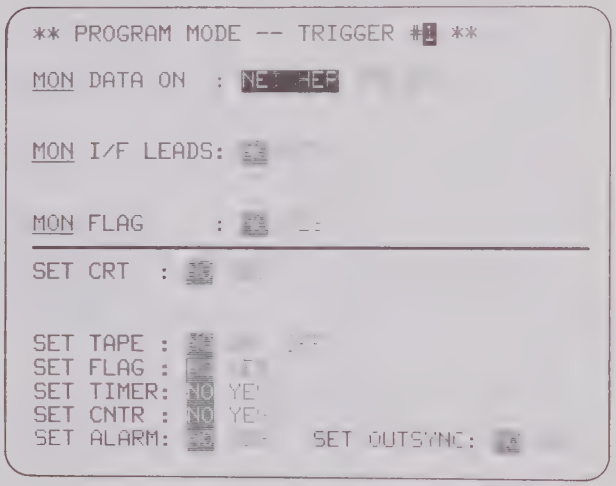


Figure 4-9

(3) set flag; (4) set timer; (5) set counter; (6) set alarm; and (7) set outsync.

4.1.4 Selective Display of Information Frames. Since we want the trigger to look for information frames, we are only interested in looking for certain data characters, and only those from the DCE. The bright reverse blinking cursor is on the default selection NEITHER in the first data selection field of the trigger menu. Use the cursor to select DCE.

A second line now appears, offering four selections; STRinG, 1 OF, GOOD

FCS, and FCS ERROR (Figure 4-10). To find an information frame we shall need to find a certain string of characters. Therefore, operate the ENTER key to move to the LOOK FOR field. The cursor will go to STRG because it is the default selection.

Under STRG, there is an underlined space, which indicates a data entry field. Press ENTER, and the cursor will go to the first position of the data entry field.

An information frame is defined by the 0 in the Bit 1 position of the second byte after an opening Flag. So, we want to look for a string composed of three bytes: a Flag, a byte not equal to a Flag (the address byte), and a byte having Bit 1 equal to zero (the control byte for an information frame).

(1) On the data entry line for STRG, enter a Flag. Remember that you must use CONTROL plus the FLAG key.

(2) To allow any byte except a Flag in the second byte position, press NOT EQUAL followed by CONTROL plus FLAG. Notice the horizontal "Not Equal" bar through the character.

(3) In the third position we need any byte with Bit 1 = 0. Press BIT MASK. A low-intensity reverse M will appear, indicating that something other than a data character M is meant. To the right is the 8-position bit mask entry field, and the cursor is at Bit 8. (See Figure 4-11.) The X's indicate Don't Care bits. Since we are only interested in Bit 1, we can immediately move the cursor to the bit 1 position on the far right, using the RIGHT cursor arrow. Enter the numeral 0 here. The low-intensity M in the third character position of the string now signifies a byte with Bit 1 = 0. Its meaning could easily be changed at any time by changing the bit pattern in the bit mask field. Press ENTER to return to the string. If other bytes were needed, you could now enter them.

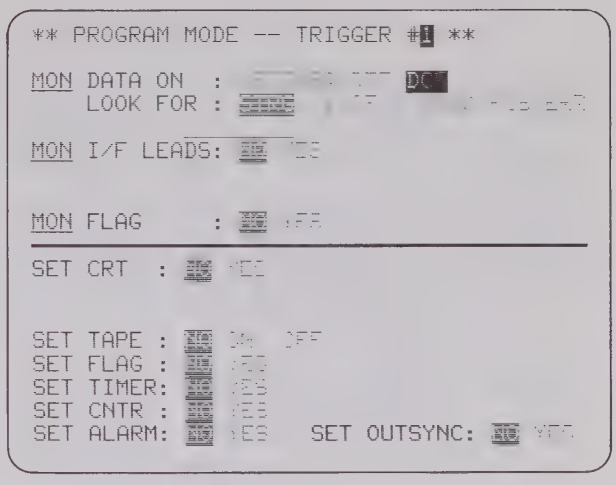


Figure 4-10

If you should wish to alter the Bit Mask, reposition the cursor on the low-intensity M and press BIT MASK. The cursor will return to the bit mask field without altering the string.

Since we want information fields to be displayed, we want the character string to turn the CRT freeze OFF. Using ENTER, tab the cursor down to the SET CRT field. Select YES, and observe that another selection field appears. Tab to the selection field and select FRZ; then enter a numeral 0 for OFF.

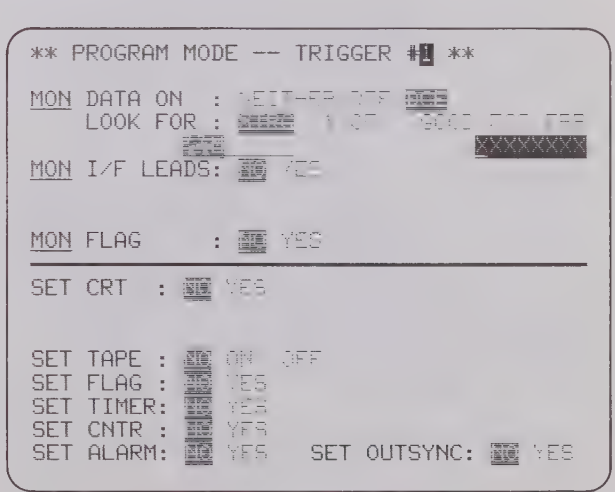


Figure 4-11

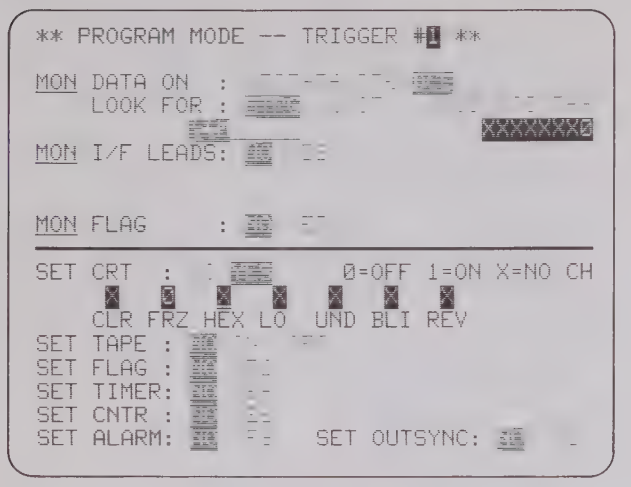


Figure 4-12

The Trigger 1 menu should now look like Figure 4-12.

We need to turn the CRT FREEZE ON again at the end of the information frame while Trigger 1 waits for the next information frame. The next Flag after the freeze is turned off, i.e., after the control frame, is always the closing Flag.

Select the Trigger #2 menu. Select DCE. Enter NOT EQUAL FLAG, FLAG in the LOOK FOR data entry field, and set the CRT FRZ to turn ON. (See Figure 4-13.)

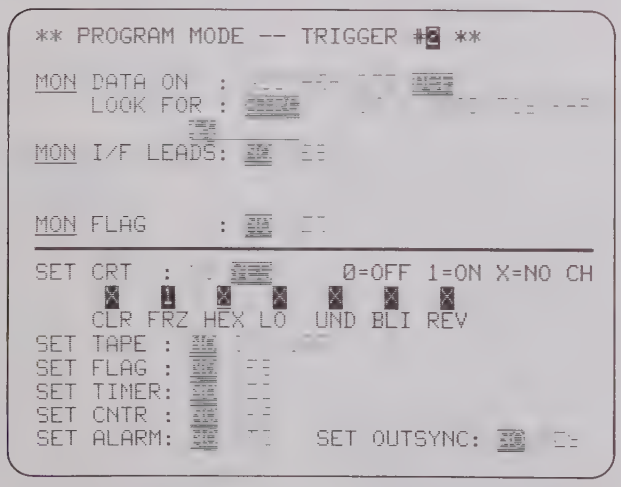


Figure 4-13

Now view the Trigger Summary (simply press TRIGGER) and notice how your entries on the individual trigger menus are summarized (Figure 4-14). The Trigger Summary is the same as the Program Summary.

MONITOR the data to see that only information packets and FCS bytes are now displayed as in Figure 4-15.

Although the dual-line display is much more compact with the Flags and protocol material suppressed, it is apparent that there is little simultaneous transmission recorded on the training tape. It will be more effi-

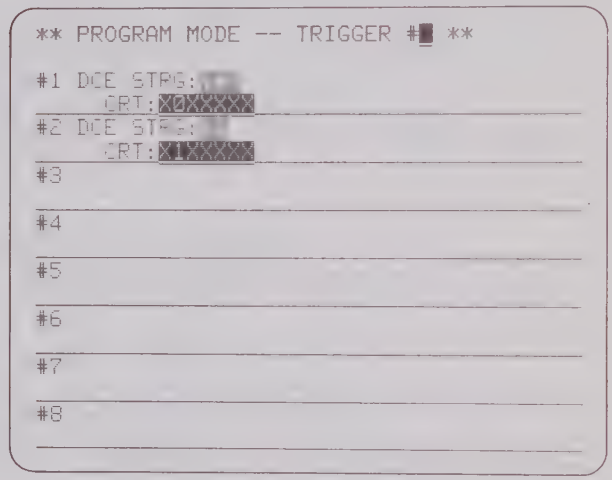


Figure 4-14

cient for analysis, therefore, to display the data in single-line mode. To do this, return to Program Mode; select the CRT Control menu (PARAMETERS 2), and select SINGLE line instead of DUAL line. The display will now appear as in Figure 4-16. (Use CONTROL plus HEX to help distinguish the LCNs from the packet-type octets.)

Because the first two bytes of each frame have not been received in the display buffer, the P key cannot be used to find the packet-type octets automatically. However, you may still obtain packet-type expansions by positioning the cursor manually on the packet-type octet, that is, the third

character in any packet. Operate CONTROL plus P to obtain the correct acronym expansion, as in Figure 4-17 (in the figure, the cursor is near the center of the display). Note that CONTROL must be used with the P key in this case.

Remember that when CONTROL plus P is used, the logic cannot identify your mistakes: it will display an expansion of whatever byte is at the cursor location, whether valid or not.

4.1.5 Selective Display of Traffic on One Logical Channel. We can modify the program already in the unit (Section

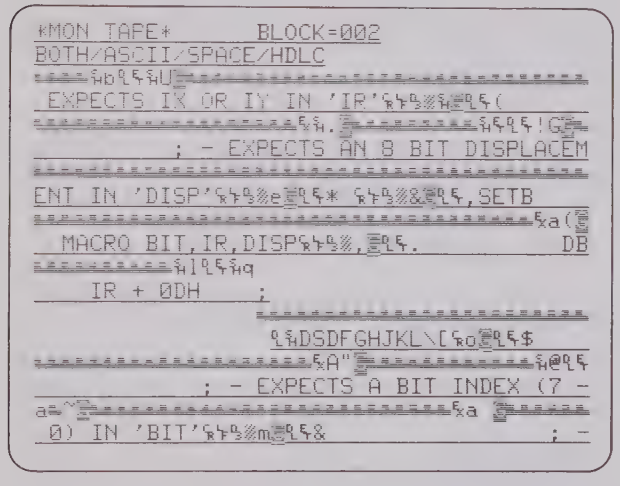


Figure 4-15

4.1.4) to display only the data on a specific logical channel. To do this, we program the triggers to look into the first two packet bytes for the LCN. We shall illustrate this by displaying only transmissions on LCN 0004, whether information, supervisory, or nonsequenced.

(1) Select the Trigger #1 menu, and use the ENTER key to position the cursor in the LOOK FOR STRG data entry field. Move the cursor to the low-intensity M. Clear the Bit Mask with

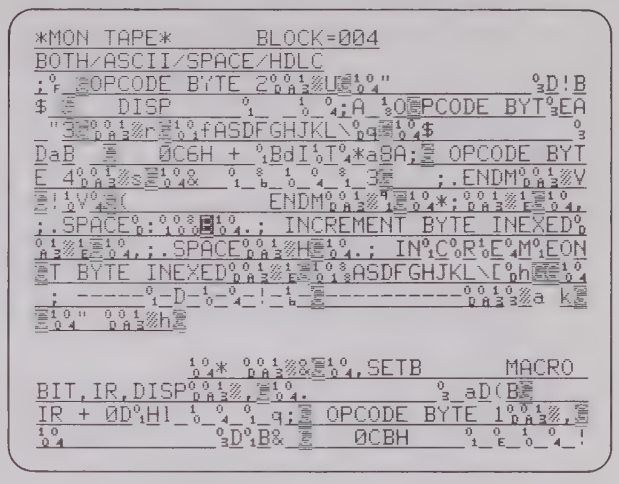


Figure 4-16

SHIFT plus CLEAR FIELD. The cursor will remain at the third position in the string.

(2) Operate the DON'T CARE key to indicate that any bit combination in that position in the string is valid for the control byte.

(3) Next enter the logical channel number information for the first two packet octets, 10 04_{16}. The HEX key is a two-character latch, so to enter the LCN use the key sequence HEX, 1, 0; HEX, 0, 4.

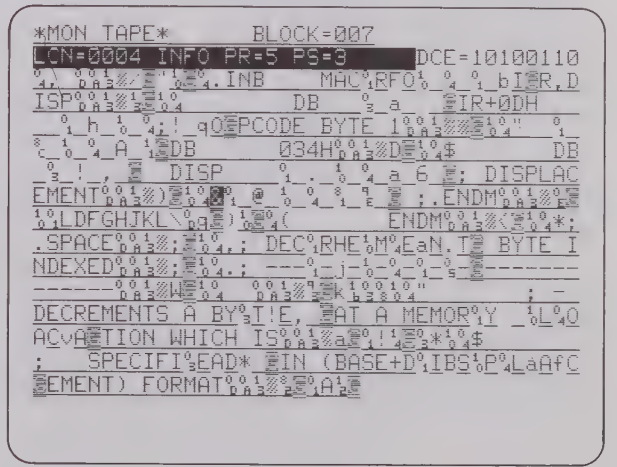

MON TAPE BLOCK=007
LCN=0004 INFO PR=5 PS=3
DCE=10100110
.INB MAC RFO bI R,D
ISP DB a IR+0DH
h q PCODE BYTE 1
A DB 034H D $ DB
DISP a 6 ; DISPLAC
EMENT ; .ENDM
LDFGHJKL\ ENDM *;
.SPACE ; DEC RHE M EaN.T BYTE I
NDEXED ; ----
k
DECREMENTS A BY I'E, AT A MEMOR Y L O
AC A TION WHICH IS a $
; SPECIFI EAD* IN (BASE+D IBS P LaAfC
EMENT) FORMAT A

Figure 4-17

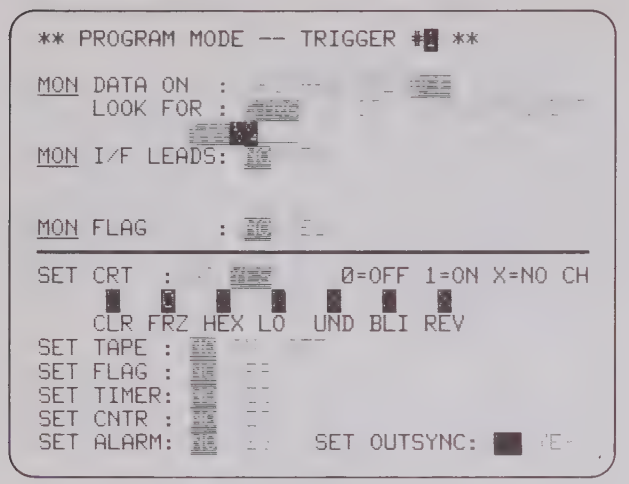


Figure 4-18

(4) You have now programmed Trigger #1 to unfreeze the CRT upon receipt of any frame on LCN 0004. (See Figure 4-18.)

(5) Trigger #2 has already been set to freeze the data after the closing Flag (Figure 4-14).

Go to Monitor Mode. All frames on Logical Channel 0004 are displayed, whether information, supervisory, or nonsequenced (Figure 4-19).

By including the packet-type octet (Octet 3) in the unfreeze string for

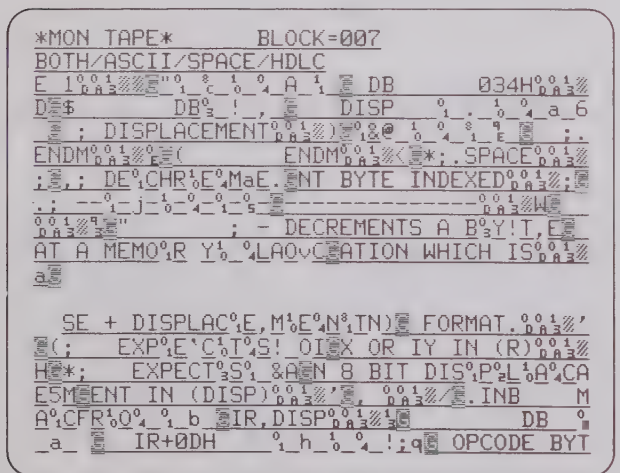


Figure 4-19

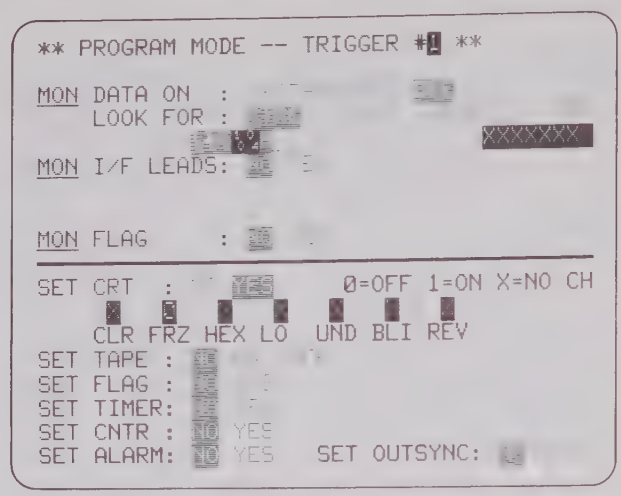


Figure 4-20

Trigger #1, we can limit the display of frames on LCN 0004 to a specific packet type. To display only information packets add a Bit Mask to the string and enter zero in the Bit 1 position (Figure 4-20).

Now the display consists solely of information packets on LCN 0004 and the data can be read almost as straight text (Figure 4-21).

Observe that each packet terminates with CR LF followed by a few other characters that are not useful in understanding the information content

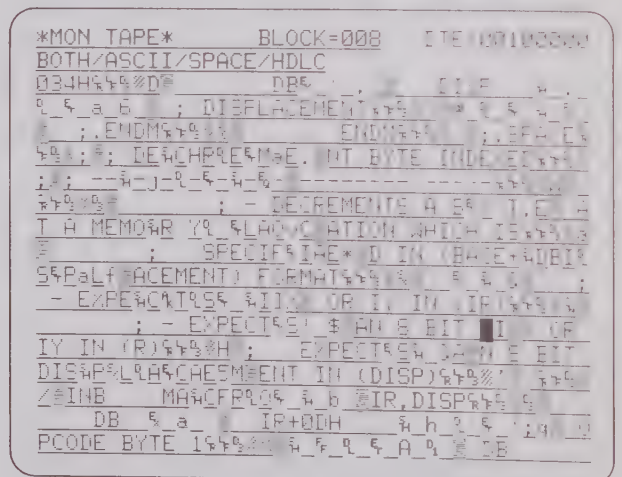


Figure 4-21

of the packet. To suppress these assorted characters, change Trigger #2 to turn CRT freeze ON after the string CR LF is received instead of waiting for the closing Flag byte. (See Figures 4-22 and 4-23.) Since CR and LF are control character mnemonics, enter them using the CONTROL key plus the CR or LF key.

The three characters CR, LF, and ; appear throughout the display and detract from its readability. Suppress them by adding them to the SUPPRESS list on the CRT CONTROL (Parameters 2) menu.

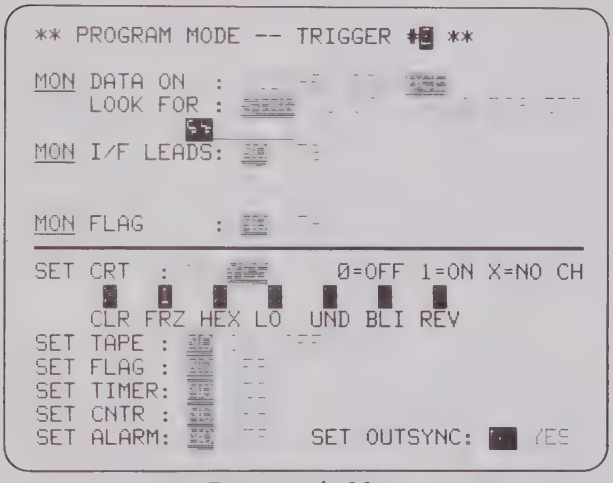


Figure 4-22

NOTE: If a circuit is very busy, it may be advantageous, for example to select only DCE on the Parameters 1 menu in order to eliminate spurious characters from the DTE.

Select DCE on the Parameters 1 menu and then observe the display. As in Figure 4-24, it is a clear, readable presentation of only the information on Logical Channel 0004 and can easily be compared with the input (or output) of that terminal.

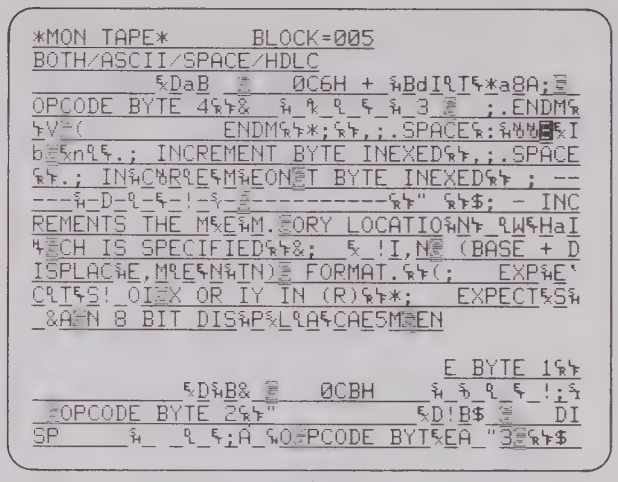


Figure 4-23

NOTE: In some instances, CR or LF or any suppressed character may be of significance to the user, e.g., it may be part of the message content. It will nevertheless be suppressed whenever it appears.

4.2 THE TRAINING TAPE PROGRAM

The program on the training tape is designed specifically for monitoring ASCII data in X.25 format. The basic parameters of the program are shown in

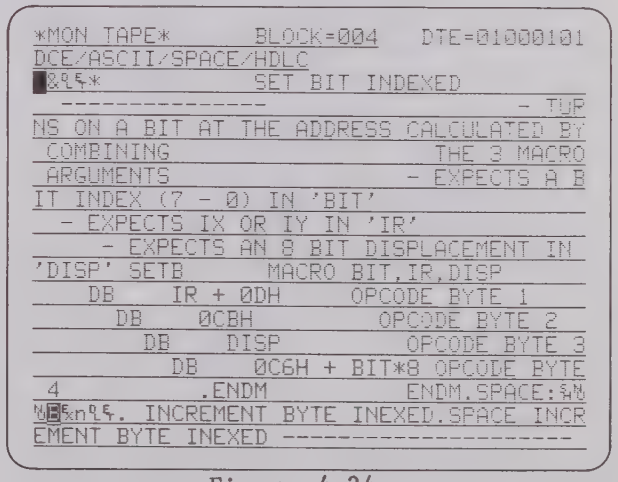

MON TAPE BLOCK=004 DTE=01000101
DCE/ASCII/SPACE/HDLC
SET BIT INDEXED
- TYP
NS ON A BIT AT THE ADDRESS CALCULATED BY
COMBINING THE 3 MACRO
ARGUMENTS - EXPECTS A B
IT INDEX (7 - 0) IN 'BIT'
- EXPECTS IX OR IY IN 'IR'
- EXPECTS AN 8 BIT DISPLACEMENT IN
'DISP' SETB MACRO BIT,IR,DISP
DB IR + 0DH OPCODE BYTE 1
DB 0CBH OPCODE BYTE 2
DB DISP OPCODE BYTE 3
DB 0C6H + BIT*8 OPCODE BYTE
4 .ENDM ENDM.SPACE:
. INCREMENT BYTE INEXED.SPACE INCR
EMENT BYTE INEXED

Figure 4-24

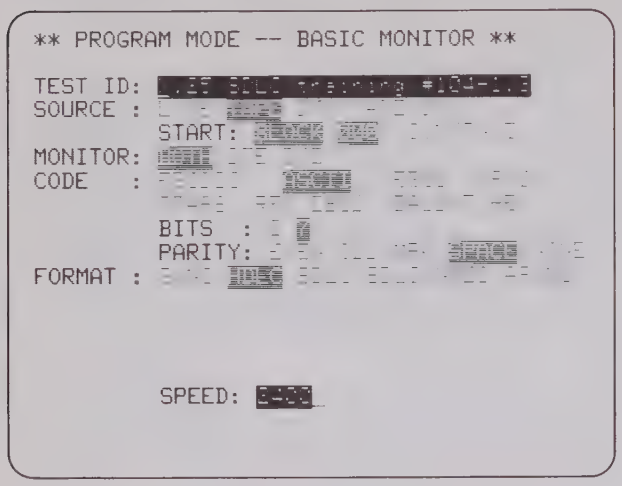


Figure 4-25

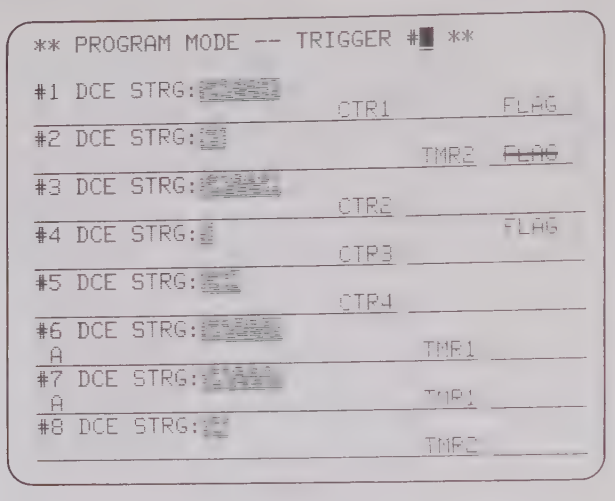


Figure 4-27

Figures 4-25 and 4-26. The Parameters 1 setup is the same one that you entered in Section 4.1. The display is dual line and Flags are suppressed. Figure 4-27 is the Trigger Summary and Figure 4-28 is the statistics menu.

4.2.1 Frame and Packet Efficiency. Network utilization can be determined easily with the training tape program. The program analyzes traffic from the DCE or NODE but it can be edited easily to look at traffic originating at the DTE.

Packet Efficiency is the percentage of data packets to all packets. Counter 1 counts data packets and Counter 2 counts all other packets, using the Bit Mask XXXX XXX0 to define the packet-type octet for an information packet. Inspection of Figure 4-29 (which was not made from the training tape data) shows that 50% of the packets are for supervisory or control purposes; the packet efficiency is therefore 50%.

Average packet size is another valuable parameter. It is relevant for node throughput and memory allocation analysis. It also reveals whether messages are being combined to minimize the packet count. Since many administrations charge on a packet basis, whether or not the packets are full, this information can be important. On

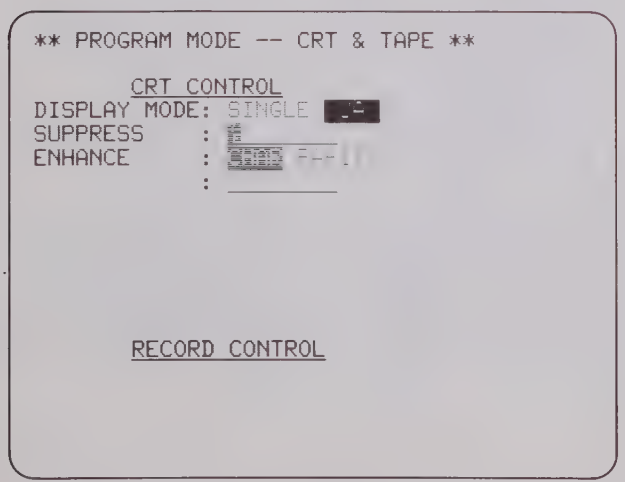


Figure 4-26

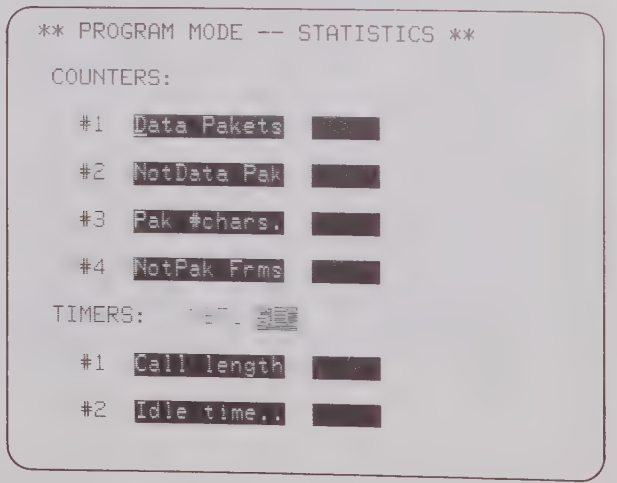


Figure 4-28

Trigger 4, Counter 3 is set to increment for every byte received while Flag 1 is ON, that is, every byte received between the packet-type octet defined by the string on Trigger 1 and the end of the packet defined by the string on Trigger 2. Using the data of Figure 4-29, we see that division of Counter 1 (number of data packets) into Counter 3 (cumulative number of data packet bytes) gives approximately 30 bytes per packet. This amounts to only 25 percent utilization on a network that provides 128-byte packets.

Frame efficiency is the ratio of packets (or information frames) to supervisory or control frames. Counter

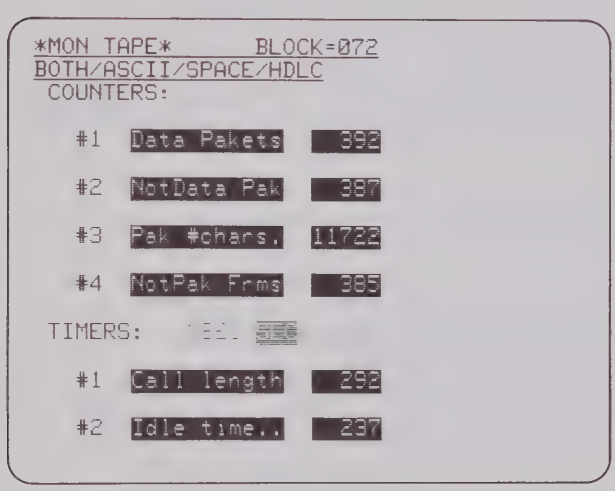


Figure 4-29

4 counts all frames other than packet frames (all noninformation frames). The total of Counter 1 (data packets) and Counter 2 (nondata packets) in Figure 4-29 gives the number of packets, which is the number of information frames. There are two packet frames for every nonpacket frame, so the frame efficiency of the circuit is approximately 2:3 or 67 percent.

4.2.2 Call/Circuit Utilization. Timer 1 is ON between the CALL ACCEPT packet, Trigger 6, and the CLEAR packet, Trigger 7 (see Figures 4-30 and 4-31). This timer displays the duration of the call. Since the X.25 section of the

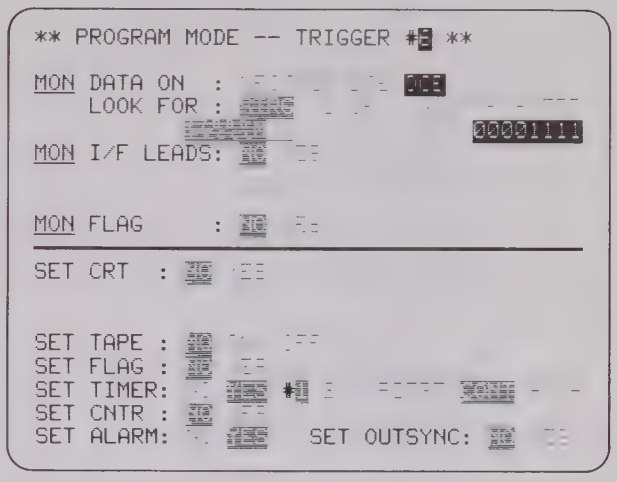


Figure 4-30

training tape does not contain a CALL ACCEPT packet, this timer will remain at 00 when the training tape is being monitored.

Timer 2 accumulates the time between frames, that is, from the string on Trigger 2 to the string of Trigger 8, which is idle circuit time.

In the data of Figure 4-32 only 12 out of 74 seconds were utilized for sending frames. This could indicate that personnel making manual entries need further training. Use of a batch-type terminal to store the data on tape before transmission might improve efficiency.

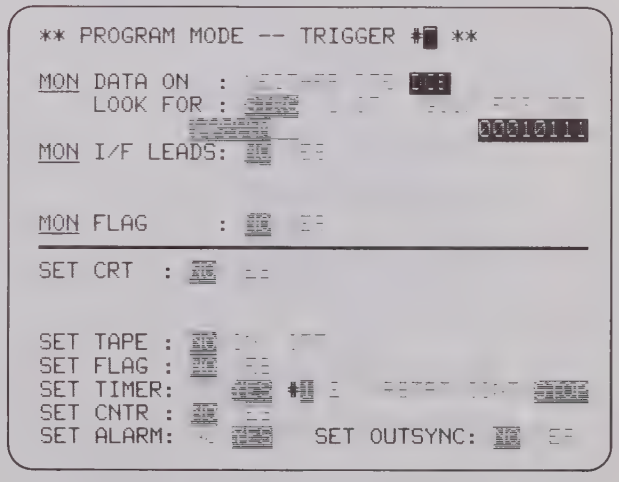


Figure 4-31

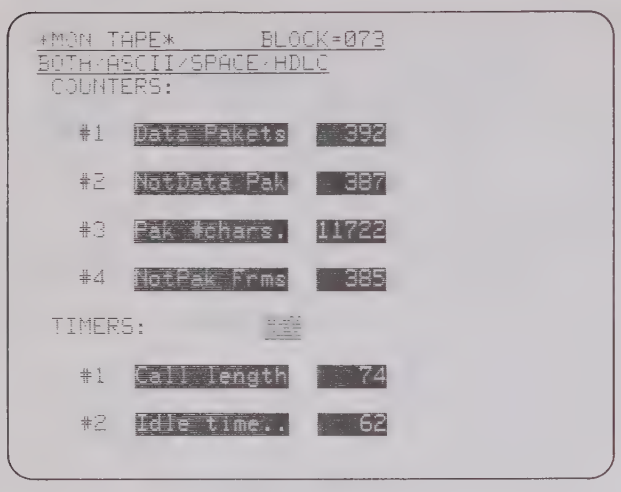


Figure 4-32

NOTE: As shown in Figure 4-32, the timer is set to count in seconds. When the periods being counted are less than seconds, the count will vary by at least + or - 1 second. To minimize this effect of a 1-second resolution on periods that may be shorter than 1 second, the seconds timer should be allowed to accumulate well into the hundreds. For total periods of less than 60 seconds, the millisecond range is recommended for accuracy.

NOTE: With HDLC framing, you should remember that the characters have had extra zero bits "destuffed." Therefore when you correlate character counts to time measurements you will find that there are more bits of time on the circuit than will be accounted for by adding up character times. However, the display will always show when eight bit times have been accumulated by inserting the L-shaped fill symbol on the faster data path (in dual-line display). See Section 6 (SDLC) for further details.

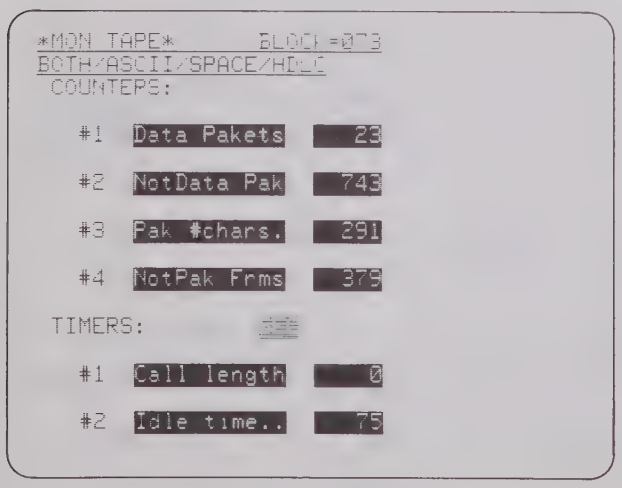


Figure 4-33

4.2.3 DTE Analysis. On the training tape program, all triggers are assigned to the DCE. You can easily make the same measurements on the DTE path. Since the CALL/CALL ACCEPT does not appear until Block 68, the CALL duration will not accumulate.

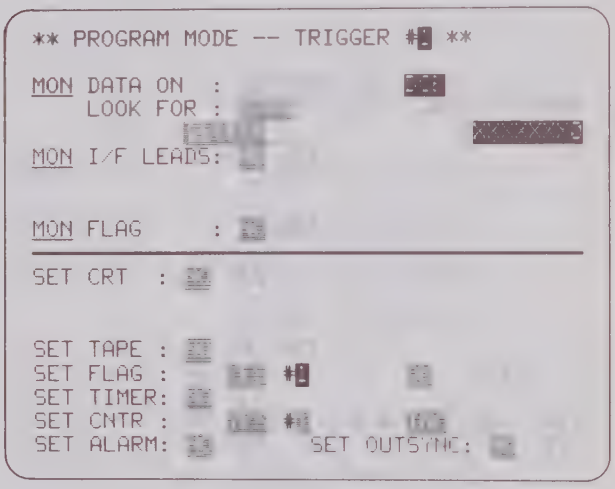


Figure 4-34

Load the training tape program. In succession, select each trigger menu and change the LOOK FOR selection to DTE. Operate MONITOR and observe the Results display around Block 073 (see Figure 4-33). Notice that there are only 23 data packets with a total of 291 characters. Obviously the DTE is generating very little traffic, and packet overhead is 743 out of a total packet count of 766. The Node servicing the terminal may be rather busy with packet handling, but moving little actual data.

4.2.4 Specific LCN Analysis. The training tape program uses DON'T CARE for the LCN octets (as in Figure 4-34). You can easily modify the strings in Triggers 1, 3, 6, and 7 to specify an LCN of interest or to exclude a specific LCN. Replace the second and third Don't Care bytes with hexadecimal values for the desired LCN bytes (see Figure 4-35, for example).

4.3 ENHANCED X.25-DLC SOFTWARE (OPTION-895-10-1)

INTERVIEW 3500 Option 895-10-1 is a software package designed for users of Bit-Oriented Protocols that use zero-bit stuffing or transparent BISYNC framing. It adds special frame (level 2) and packet (level 3) protocol display modes, which greatly increase your ability to analyze transmission sequences that have been recorded on tape.

Taped programs are upwardly compatible with this option; i.e., programs that were saved in a standard unit may be loaded into your X.25-DLC Enhanced Software unit. However, programs taped in the modified unit may not be used in a standard unit. Data recorded in either type of unit may be played back in the other.

4.3.1 Parameters 1 Menu. Select TAPE or TAPE/DTM as data source. The Basic Monitor menu is the same as the standard INTERVIEW 3500 (see Figure 4-36).

The HDLC selection gives frame and packet protocol display, while SDLC and SDLC/NRZI permit only frame display. Thus, the HDLC frame acronym set given in Table 4-1 is oriented toward X.25 and X.75, whereas that shown for the SDLC selections uses IBM SNA-type acronyms. Users of other protocols such as BDLC may select either HDLC or SDLC, depending on which set of acronyms best meets their requirements. Select HDLC for any of the protocols falling under that general category, including X.25 and X.75. As in the standard unit,

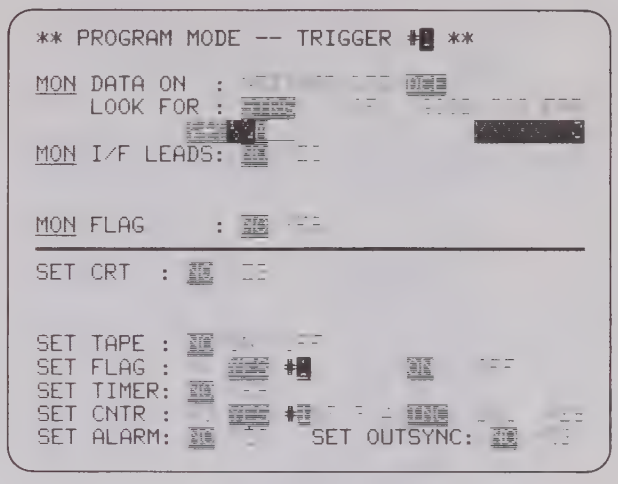


Figure 4-35

select SYNC for BISYNC framing. For SDLC, select either SDLC or SDLC/NRZI, the latter for NonReturn to Zero encoding.

4.3.2 Parameters 2 Menu.

(a) DISPLAY MODE. To display data on the CRT, select either SINGLE or DUAL line mode, just as you would in the standard 3500. Either of these selections enables the same ENHANCE and SUPPRESS fields available in the standard unit.

PACKET and FRAME appear as DISPLAY MODE selections only when TAPE or TAPE/DTM has been selected as SOURCE on the

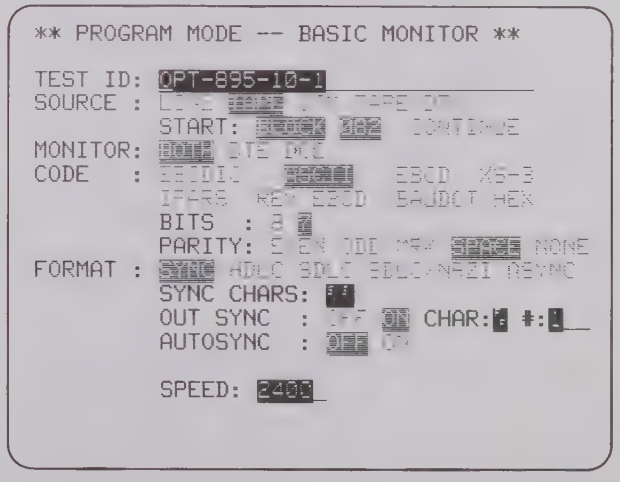


Figure 4-36

Table 4-1 OPT-895-10-1 Mnemonics

Table 4-1a X.25 Frame Level

Mnemonic	Definition	Binary
INFO	INFOrmation	X X X X X X X 0
RR	Receiver Ready	X X X X 0 0 0 1
RNR	Receiver Not Ready	X X X X 0 1 0 1
REJ	REJect	X X X X 1 0 0 1
SREJ	Selective REJect	X X X X 1 1 0 1
DISC	DISConnect	0 1 0 X 0 0 1 1
UA	Unnumbered Acknowledge	0 1 1 X 0 0 1 1
FRMR	FRaMe Reject	1 0 0 X 0 1 1 1
DM/SARM	Disconnect Mode/Set Asynchronous Response Mode	0 0 0 X 1 1 1 1
SABM	Set Asynchronous Balance Mode	0 0 1 X 1 1 1 1

Table 4-1b X.25 Packet Level

Mnemonic	Definition	Binary
DATA	DATA	X X X X X X X 0
RR	Receiver Ready	X X X 0 0 0 0 1
RNR	Receiver Not Ready	X X X 0 0 1 0 1
REJ	REJect	X X X 0 1 0 0 1
SREJ	Selective REJect	X X X 0 1 1 0 1
CALL	CALL	0 0 0 0 1 0 1 1
CALL ACC	CALL ACCept	0 0 0 0 1 1 1 1
CLEAR	CLEAR	0 0 0 1 0 0 1 1
CLEAR C	CLEAR Confirm	0 0 0 1 0 1 1 1
RESET	RESET	0 0 0 1 1 0 1 1
RESET C	RESET Confirm	0 0 0 1 1 1 1 1
INT	INTerrupt	0 0 1 0 0 0 1 1
INT CONF	INTerrupt CONFirm	0 0 1 0 0 1 1 1
DIAG	DIAGnostic	1 1 1 1 0 0 0 1
RSTRT	ReSTaRT	1 1 1 1 1 0 1 1
RSTRT C	ReSTaRT Confirm	1 1 1 1 1 1 1 1

Table 4-1c SDLC

Mnemonic	Definition	Binary
INFO	INFOrmation	X X X X X X X 0
RR	Receiver Ready	X X X X 0 0 0 1
RNR	Receiver Not Ready	X X X X 0 1 0 1
REJ	REJect	X X X X 1 0 0 1
SREJ	Selective REJect	X X X X 1 1 0 1
NSI	Non-Sequenced Information	0 0 0 X 0 0 1 1
NSP	Non-Sequenced Poll	0 0 1 X 0 0 1 1
DISC/RQD	DISConnect/ReQuest Disconnect	0 1 0 X 0 0 1 1
NSA	Non-Sequenced Acknowledge	0 1 1 X 0 0 1 1
SNRM	Set Normal Response Mode	1 0 0 X 0 0 1 1
TEST	link TEST	1 1 1 X 0 0 1 1
SIM/RQI	Set Initialization Mode/ ReQuest Initialization	0 0 0 X 0 1 1 1
RGA	Remote Go-Ahead	0 1 0 X 0 1 1 1
CMDR	CoMmanD Reject	1 0 0 X 0 1 1 1
CFGR	ConFiGuRe	1 1 0 X 0 1 1 1
SARM/ROL	Set Asynchronous Response Mode/Request OnLine	0 0 0 X 1 1 1 1
XID	eXchange station ID	1 0 1 X 1 1 1 1
BCN	BeaCoN	1 1 1 X 1 1 1 1

Parameters 1 menu. (See Figures 4-37 and 4-38.) When FRAME or PACKET has been selected, the SUPPRESS and ENHANCE fields disappear.

When you select FRAME or PACKET, data will not be displayed in Monitor Mode. Instead, you will see a sequential display of only frame (level 2) or packet (level 3) protocol. Figures 4-39 and 4-40 are examples. Two new data-entry fields become available to help you specify which frame or packet types you wish to have expanded.

FRAME. The Monitor Mode display (see Figure 4-39) will show the address, frame type, N(R), N(S), and P/F bit value. For HDLC or SDLC, blocks

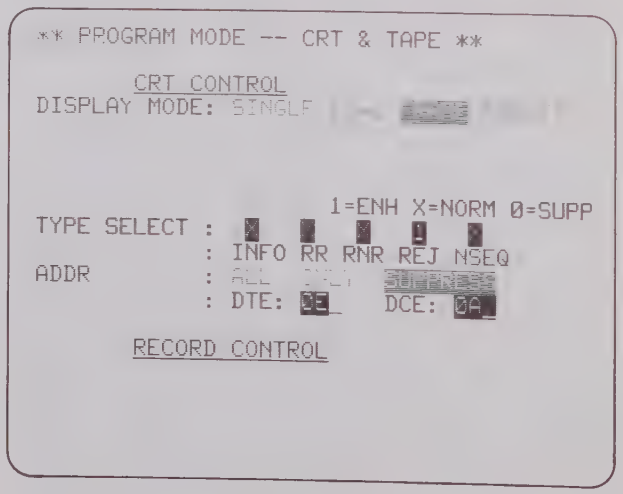


Figure 4-37

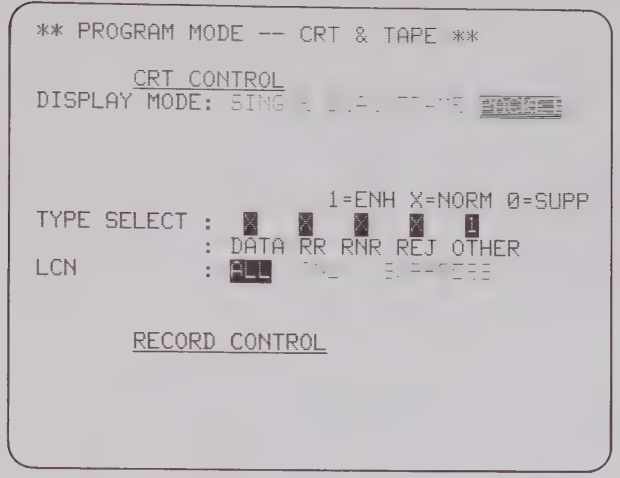


Figure 4-38

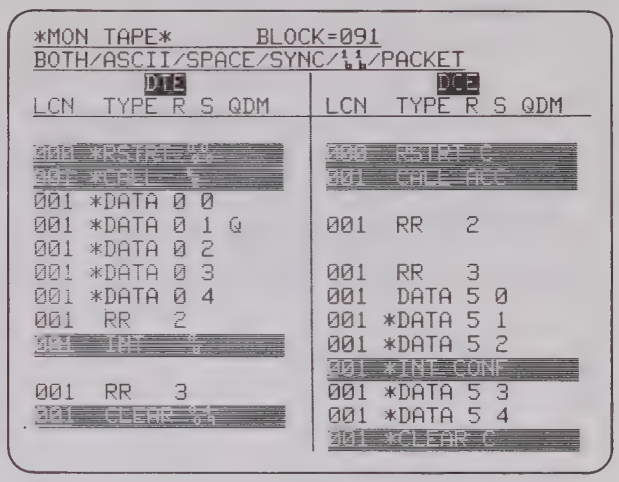


Figure 4-40

will be identified as Good, Bad, or Aborted by reverse G, B, or A, respectively. (See Figure 4-41.) Notice that the B or A symbol is shown in bright reverse image.

PACKET. You may select PACKET only if you have selected HDLC or SYNC FORMAT on the Parameters 1 menu. The Monitor Mode display (see Figure 4-40) will then show LCN (Logical Channel Number), packet-type mnemonic, P(R), and P(S). Q, D, and M will be displayed when they are ON (bit value = 1). As in the case of the FRAME display, Good, Bad, and Aborted blocks will be identified except in SYNChronous operation.

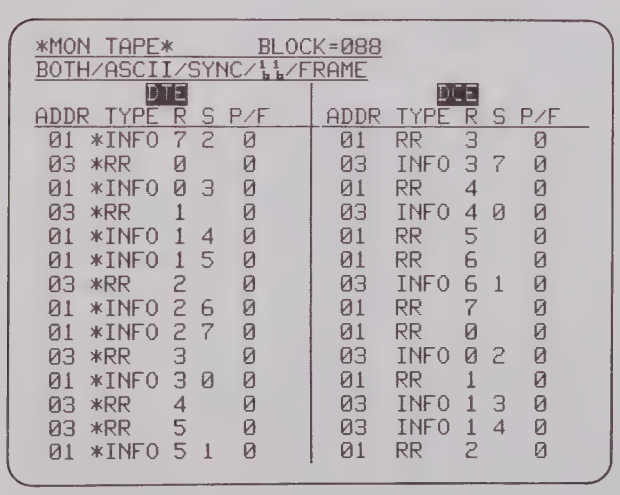

MON TAPE BLOCK=088
BOTH/ASCII/SYNC/
/FRAME
DTE
DCE
ADDR TYPE R S P/F
01 *INFO 7 2 0
03 *RR 0 0
01 *INFO 0 3 0
03 *RR 1 0
01 *INFO 1 4 0
01 *INFO 1 5 0
03 *RR 2 0
01 *INFO 2 6 0
01 *INFO 2 7 0
03 *RR 3 0
01 *INFO 3 0 0
03 *RR 4 0
03 *RR 5 0
01 *INFO 5 1 0
01 RR 3 0
03 INFO 3 7 0
01 RR 4 0
03 INFO 4 0 0
01 RR 5 0
01 RR 6 0
03 INFO 6 1 0
01 RR 7 0
01 RR 0 0
03 INFO 0 2 0
01 RR 1 0
03 INFO 1 3 0
03 INFO 1 4 0
01 RR 2 0

Figure 4-39

(b) TYPE SELECT. This is a data-entry field that appears upon selection of FRAME or PACKET. (Refer to Figures 4-37 and 4-38.) The default condition is normal (X) video display of the expansions of the five selections. Enter 1's for any of the frame or packet types to display the selected frames or packets in low-intensity reverse image. Enter 0's to suppress display of any selections.

For FRAME, the selections are INFO, RR, RNR, REJ, and NSEQ (see Figure 4-37). For PACKET, they are DATA, RR, RNR, REJ, and OTHER (as shown in Figure 4-38).

(c) ADDR or LCN. The ADDRess or LCN field appears on the next line only

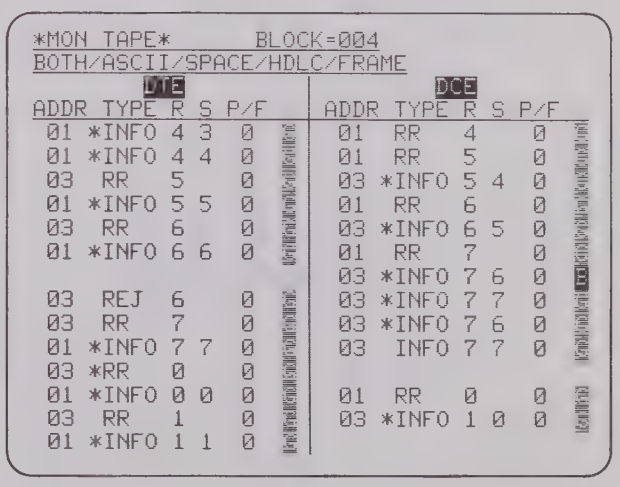

MON TAPE BLOCK=004
BOTH/ASCII/SPACE/HDLC/FRAME
DTE
DCE
ADDR TYPE R S P/F
01 *INFO 4 3 0
01 *INFO 4 4 0
03 RR 5 0
01 *INFO 5 5 0
03 RR 6 0
01 *INFO 6 6 0
03 REJ 6 0
03 RR 7 0
01 *INFO 7 7 0
03 *RR 0 0
01 *INFO 0 0 0
03 RR 1 0
01 *INFO 1 1 0
01 RR 4 0
01 RR 5 0
03 *INFO 5 4 0
01 RR 6 0
03 *INFO 6 5 0
01 RR 7 0
03 *INFO 7 6 0
03 *INFO 7 7 0
03 *INFO 7 6 0
03 INFO 7 7 0
01 RR 0 0
03 *INFO 1 0 0

Figure 4-41

```
** PROGRAM MODE -- CRT & TAPE **

        CRT CONTROL
DISPLAY MODE: SINGLE DUAL FRAME PACKET


                          1=ENH X=NORM 0=SUPP
TYPE SELECT :  _   _   _   _   1
            : INFO RR RNR REJ NSEQ
ADDR        : ALL  ONLY  SUPPRESS
            : DTE: ___   DCE: ___

        RECORD CONTROL
```

Figure 4-42

when FRAME or PACKET, respectively, has been selected in the DISPLAY MODE field. There are two fields for this selection. (See Figures 4-37 and 4-38.) The first line is a data-selection field. For the default selection ALL, mnemonic expansions for all traffic are displayed. If you select ONLY, only the traffic for the addresses or LCNs entered on the next line (see Figure 4-42) will be displayed. SUPPRESS prevents display of mnemonic expansions for the addresses or LCNs entered on the next line.

On the next line, enter the addresses or logical channel numbers in which you are interested in both the DCE and DTE fields. When these fields

```
** PROGRAM MODE -- CRT & TAPE **

        CRT CONTROL
DISPLAY MODE: SINGLE DUAL FRAME PACKET


                          1=ENH X=NORM 0=SUPP
TYPE SELECT :  X   X   X   X   1
            : DATA RR RNR REJ OTHER
LCN         : ALL  ONLY  SUPPRESS
            : DTE: 004   DCE: 000

        RECORD CONTROL
```

Figure 4-43

are displayed you must make entries for both sides of the circuit; where there is no entry the selection will default to 0. If you have selected FRAME on the DISPLAY MODE line above, enter two-digit hexadecimal frame-level addresses. If you have selected PACKET above, enter the logical channel numbers in hexadecimal (three digits), as shown in Figure 4-43.

> NOTE: You simply enter the hexadecimal digits directly from the keyboard. The HEX key is invalid in the ADDR or LCN field.

4.3.3 Triggers. When FRAME or PACKET has been selected for display mode on

```
*MON TAPE*          BLOCK=004
BOTH/ASCII/SPACE/HDLC/FRAME
          DTE                          DCE
ADDR TYPE  R S P/F          ADDR TYPE  R S P/F
 01 *INFO 4 3  0             01  RR   4    0
 01 *INFO 4 4  0             01  RR   5    0
 03  RR   5    0             03 *INFO 5 4  0
 01 *INFO 5 5  0             01  RR   6    0
 03  RR   6    0             03 *INFO 6 5  0
 01 *INFO 6 6  0             01  RR   7    0
                             03 *INFO 7 6  0
                             03 *INFO 7 7  0
 03  RR   7    0             03 *INFO 7 6  0
 01 *INFO 7 7  0             03  INFO 7 7  0
 03 *RR   0    0
 01 *INFO 0 0  0             01  RR   0    0
 03  RR   1    0             03 *INFO 1 0  0
 01 *INFO 1 1  0             01  RR   2    0
```

Figure 4-44

the Parameters 2 menu, no trigger CRT enhancements except Clear CRT and CRT Freeze should be programmed.

4.3.4 Monitor Mode. Frame or packet protocol--depending on the Parameters 2 menu selection--will be listed in two columns, DTE on the left, and DCE on the right (see Figures 4-39 and 4-40). As new frames are received, the display scrolls up, so the oldest received frames are at the top of the screen. If multiple frames are received on one side of the line, then spaces are inserted on the other side to maintain time correlation between TD and RD. If two frames or packets are received at about the same time, they are displayed

on the same line. An asterisk precedes the control-type mnemonic of the frame or packet that was received first.

In the frame display, the address, control type, N(R) and N(S) counts, and P/F bit status are displayed. In the packet display, the LCN, packet type, P(R) and P(S) counts, and Q, D, and M bit status are displayed. In some non-sequenced packet types there are additional bytes of interest. In these cases, since there are no P(R) or P(S) counts, the space reserved for P(R) and P(S) is used to display the additional causing characters in hexadecimal. For CALL and INTERRUPT packets, one additional byte is displayed (Octet 4), and for CLEAR, RESET, RESTART, and DIAGNOSTIC packets, two extra bytes (Octets 4 and 5) are shown (see Figure 4-40, for example).

The Parameters 2 selections shown in Figure 4-37 would produce the frame display of Figure 4-44. Notice that the REJect line is reverse-image enhanced. The packet display of Figure 4-40 shows the progression of a call setup at the packet level with the supervisory packets enhanced. Figure 4-45 is an example of SDLC protocol display.

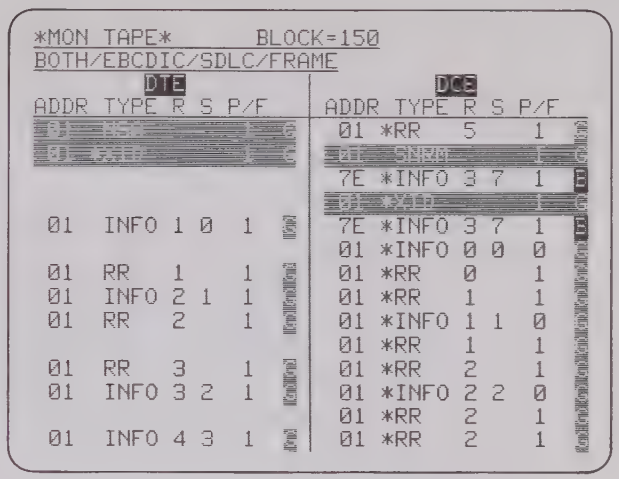

MON TAPE BLOCK=150
BOTH/EBCDIC/SDLC/FRAME
DTE
ADDR TYPE R S P/F
01 INFO 1 0 1
01 RR 1 1
01 INFO 2 1 1
01 RR 2 1
01 RR 3 1
01 INFO 3 2 1
01 INFO 4 3 1
DCE
ADDR TYPE R S P/F
01 *RR 5 1
7E *INFO 3 7 1
7E *INFO 3 7 1
01 *INFO 0 0 0
01 *RR 0 1
01 *RR 1 1
01 *INFO 1 1 0
01 *RR 1 1
01 *RR 2 1
01 *INFO 2 2 0
01 *RR 2 1
01 *RR 2 1

Figure 4-45

You can vary playback speed using the UP and DOWN cursor arrows in the same way as when data is displayed. When the display is frozen, you can scroll through the buffer using the B, E, and cursor keys. Although the display appears to be real time up to 9600 bps, it is not designed to be used on line.

Table 4-1 lists the frame and packet mnemonics displayed by OPT-895-10-1.

5 BISYNC-Framed X.25

5.1 GENERAL

X.25 can be framed with transparent BISYNC instead of HDLC (or bit stuffing). In this case, select SYNChronous FORMAT on the Parameters 1 menu since entering HDLC in the 3500 enables bit stuffing.

Two types of transparent BISYNC framing are in general use: EBCDIC with SYN = 32_{16} and ASCII with SYN = 16_{16}. ASCII with SYN = 96_{16} is seldom found. The EBCDIC or ASCII framing does not necessarily define the data code: the codes are often mixed. EBCDIC data may be framed with ASCII; or ASCII data may be framed with EBCDIC.

5.2 TRAINING TAPE DATA

The data on Blocks 080 to 095 of the training tape is BISYNC-framed X.25 with ASCII data, 7 information bits, space parity, and SYN = 16_{16}.

5.2.1 Parameters Setup. Power up the 3500 without a tape, and display the Parameters 1 menu. Make the following selections:

```
SOURCE:    TAPE
START AT:  BLOCK 080
MONITOR:   BOTH
CODE:      ASCII
BITS:      7
PARITY:    SPACE
```

The display should appear as in Figure 5-1. For transparent BISYNC framing, we want SYNChronous FORMAT, which is the default selection. The synchronization characters default to the values for space-parity ASCII, 16 16_{16}, so there is no need to make further selections on this menu.

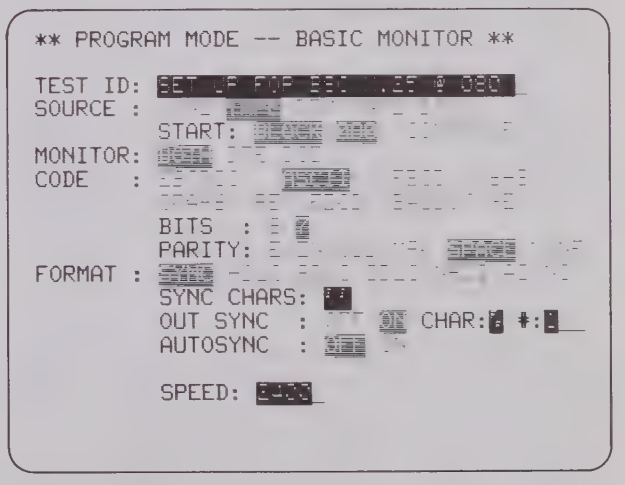


Figure 5-1

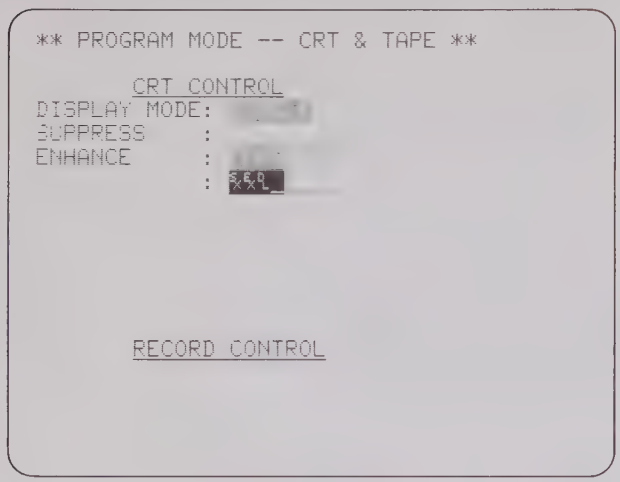


Figure 5-2

On the Parameters 2 menu, select SINGLE line in the DISPLAY MODE. Position the cursor on the data entry line below ENHANCE and, holding down the CONTROL key, type in STX, ETX, and DLE (see Figure 5-2). In Monitor Mode the enhanced control characters will be displayed in blinking bright reverse image (see Figure 5-3).

5.2.2 Display of Transparent Data. Operate MONITOR. The tape control logic will position the tape at Block 080 before playback starts. Allow the tape to run to Block 095 to fill the display buffer; then press MANUAL FREEZE. (Note: there is a pause in the data between Blocks 081 and 084.) The BISYNC framing can be clearly discerned because the framing characters are enhanced. Each transmission (that is, each frame) begins with DLE STX and ends with DLE ETX CRC1 CRC2.

Operate the HEX key. Notice that the enhanced DLEs are all 10's in hexadecimal, but the DLEs in normal video are 90_{16}. The 90_{16} DLEs have the bit pattern 1001 0000 but are displayed as DLEs because the CRT logic reads only 7 bits when a 7-bit code has been selected. The Parameters 2 logic, however, sees the mark parity bit and enhances only characters with the bit pattern 0001 0000.

Since DLE (10_{16}) is used as an indicator prior to STX and ETX, it must be distinguished from 10_{16} in the data. The BISYNC rules require another 10_{16} to be inserted before any data 10_{16}. The extra DLE is thrown away upon receipt, but of course you will see it when you are monitoring the line. Octet 1 is usually 10_{16} for LCNs below 256; therefore the dual DLE (10 10_{16}) occurs with some frequency in this display.

> NOTE: When you are counting to find a particular octet, remember to disregard one of every two consecutive 10_{16} DLEs.

Return the data display to clear text using the HEX key. Operate CONTROL plus HEX. This will display not only the control characters in hexadecimal but also those text data characters having the same mnemonics. This problem arises frequently because the X.25 control bytes frequently fall in the same range of hexadecimal values as the BISYNC control values. The 90_{16} DLEs are examples. You will find that using CONTROL plus HEX on transparent data displays is a very useful device for distinguishing the real control characters. (See Figure 5-4.)

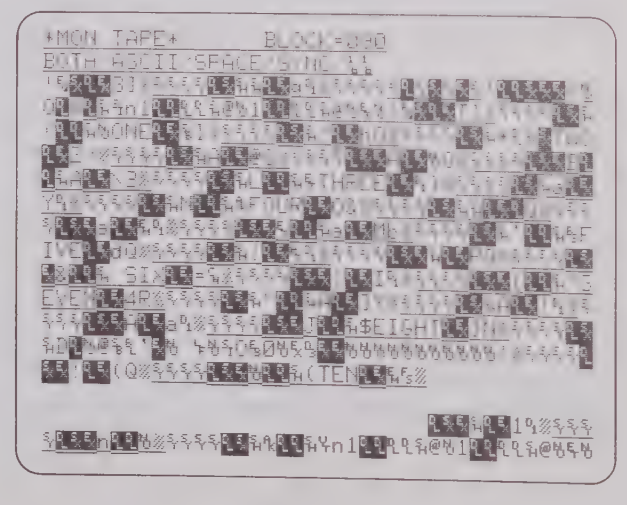


Figure 5-3

NOTE: In transparent BISYNC-framed X.25, DLEs are frequently inserted near the LCN. The automatic packet locator activated by the P key is programmed to ignore the extra DLE when it counts character locations. When you are observing the display or manually selecting the bytes to be expanded using CONTROL plus P, be sure to consider the rules for transparency.

5.2.3 Packet Call Sequence. The BISYNC-framed X.25 portion of the training tape contains a packet call setup, an interrupt, and a call clear. It is instructive to observe the call sequence.

When you are making frequent use of the cursor, the large number of enhanced characters on the screen may make it difficult to identify the cursor. Select the Parameters 2 menu, place the cursor in the ENHANCE data entry field, and operate CLEAR FIELD. This cancels ENHANCE. Return to the Monitor Mode and freeze the display at Block 95.

Operate the B key to scroll to the beginning of the display buffer. There is a limited amount of BISYNC-framed

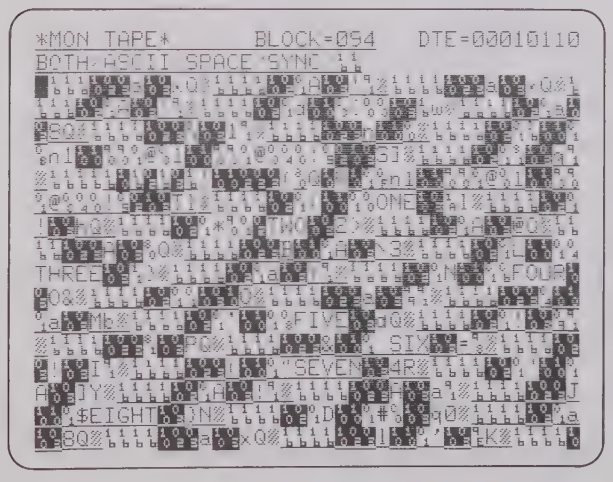


Figure 5-4

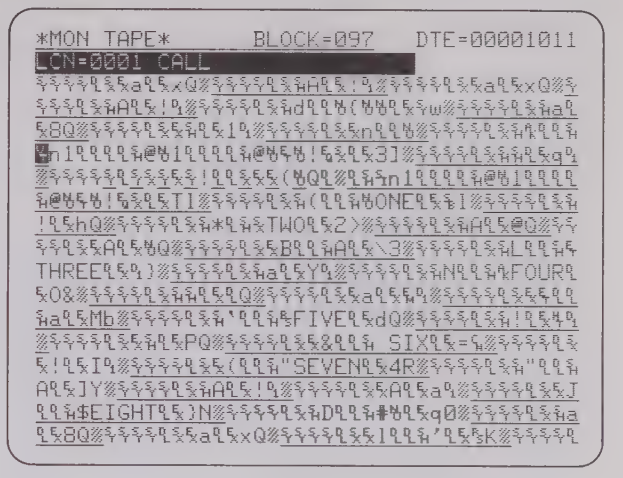


Figure 5-5

data on the tape, so the first character in the buffer will be the first character of the taped data.

Press the P key to automatically tab the cursor through the sequence of packet-type octets and display the mnemonic expansion for each packet. Table 5-1 summarizes the packet traffic on the tape. The third packet (Table 5-1b) is a CALL packet (see also Figure 5-5). The table clearly shows the sequence of all packets in the call through CLEAR.

In Table 5-1b, notice the packet DCE RR P(R)=3 following DTE INFO P(S)=3 and preceding DTE INFO P(S)=4. You might infer that the RR should have been P(R)=4 since the next P(S) is a 4. However, timing delay in the Node may permit a "skew" of one count. A similar condition may arise when window rotations are used to control the traffic flow.

Operate the B key to return to the beginning of the buffer. Use the F key to obtain the sequence of frame-control expansions of Table 5-1a.

5.2.4 Packet Highlight. You can use triggers to highlight only data packet content. The simplest approach is to set a trigger to look for a specific LCN and the data packet-type octet (Octet 3).

Table 5-1

Table 5-1a

	Type	Frame NR	NS	P/F
DTE	RR	7		0
DCE	RR	2		0
DTE	RR	7		0
DCE	RR	2		0
DTE	RR	7		0
DCE	RR	2		0
DTE	INFO	7	2	0
DCE	RR	3		0
DCE	INFO	3	7	0
DTE	RR	0		0
DTE	INFO	0	3	0
DCE	RR	4		0
DCE	INFO	4	0	
DTE	RR	1		0
DTE	INFO	1	4	0
DCE	RR	5		0
DTE	INFO	1	5	0
DCE	RR	6		0
DCE	INFO	6	1	0
DTE	RR	2		0
DTE	INFO	2	6	0
DCE	RR	7		0
DTE	INFO	2	7	0
DCE	RR	0		0
DCE	INFO	0	2	0
DTE	RR	3		0
DTE	INFO	3	0	0
DCE	RR	1		
DCE	INFO	1	3	0
DTE	RR	4		
DCE	INFO	1	4	0
DTE	RR	5		0
DTE	INFO	5	1	0
DCE	RR	2		0
DCE	INFO	2	5	0
DTE	RR	6		0
DTE	INFO	6	2	0
DCE	RR	3		0
DCE	INFO	3	6	0
DTE	RR	7		0
DCE	INFO	3	7	0
DTE	RR	0		0
DTE	INFO	0	3	0
DCE	RR	4	0	0
DCE	INFO	4	0	0
DTE	RR	1		0
DTE	INFO	1	4	0
DCE	RR	5	0	0
DCE	INFO	5	1	0
DTE	RR	2		0
DTE	RR	2		
DCE	RR	5		
DTE	RR	2		
DCE	RR	5		

Table 5-1b

	LCN	Type	Packet P(R)	P(S)	(Q)	Text
DTE	0000	Restart				
DCE	0000	Restart confirm				
DTE	0001	Call				
DCE	0001	Call accept				
DTE	1	INFO	0	0		One
DTE	1	INFO	0	1	Q	Two
DCE	1	RR	2			
DTE	1	INFO	0	2		Three
DTE	1	INFO	0	3		Four
DCE	1	RR	3			
DTE	1	INFO	0	4		Five
DCE	1	INFO	5	0		Six
DCE	1	INFO	5	1		Seven
DTE	1	RR	2			
DCE	1	INFO	5	2		Eight
DTE	1	Interrupt				
DCE	1	Interrupt confirm				
DCE	1	INFO	5	3		
DTE	1	RR	3			
DCE	1	INFO	5	4		
DTE	1	Clear				
DCE	1	Confirm				

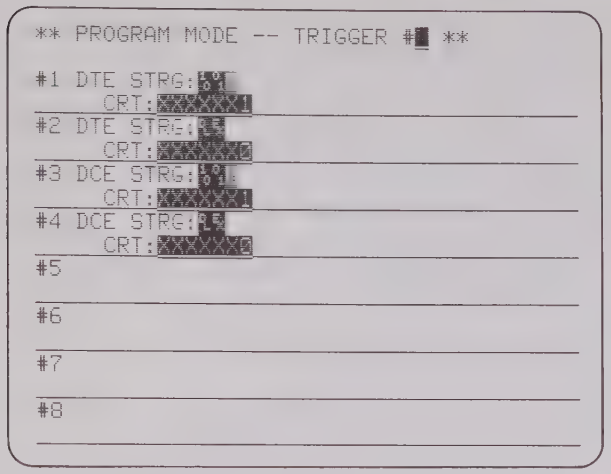


Figure 5-6

(1) Check the Trigger Summary to be sure that the triggers are at default condition, that is, no entries show on the Program or Trigger Summary.

(2) On the Trigger 1 menu, select

MON DATA ON: DTE
LOOK FOR: STRG

Enter the two LCN bytes using the key sequence HEX, 1, 0; HEX, 0, 1. Represent the data packet-type octet by a Bit Mask, XXXX XXX0 (see Section 4.1.3 to review instructions regarding the Bit Mask).

(3) Under SET CRT, select REV and enter a one (1) to turn REVerse image ON.

(4) Set Trigger 2 to look for the end-of-text sequence, DLE ETX, and to

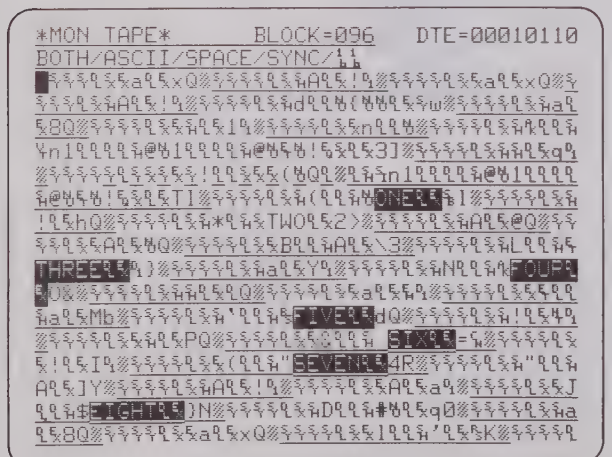


Figure 5-7

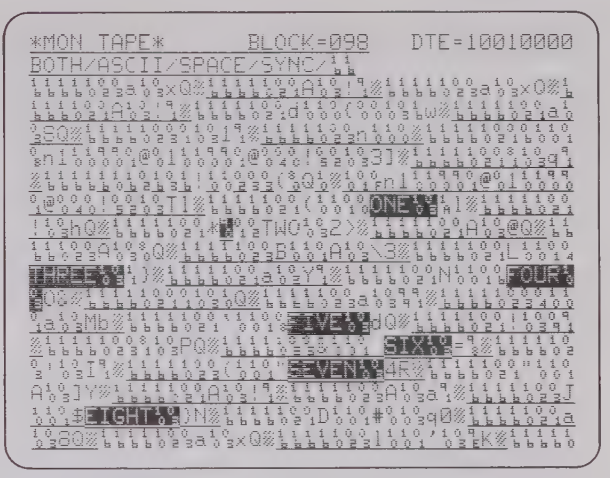


Figure 5-8

turn REVerse CRT OFF (0). Then set Triggers 3 and 4 in the same way to highlight data packets on the DCE.

The Trigger Summary should appear as in Figure 5-6.

In Monitor Mode, freeze the display manually at Block 095; then operate the B key to obtain the display of Figure 5-7. Obtain the display of Figure 5-8 using CONTROL plus HEX.

5.2.5 The Q Bit. Notice that in Figure 5-7 the data packet containing TWO was not highlighted. Why didn't the trigger catch this packet?

Use the P key to tab to the packet-type octet for that frame. Notice that the Q bit is set (see Figure 5-9).

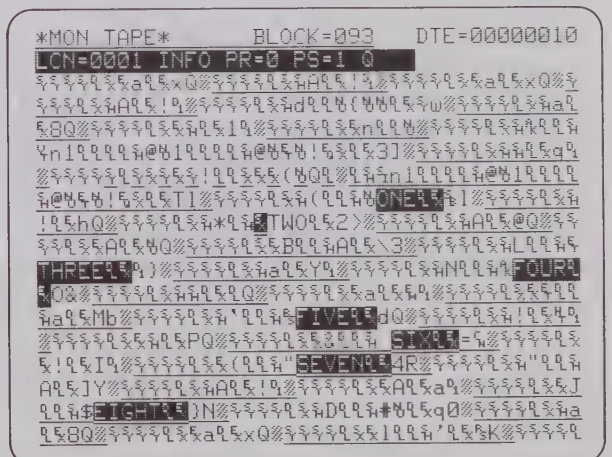


Figure 5-9

The Q bit is the first bit in Octet 1. Move the cursor to the left to Octet 1 (90_{16}). Notice from the bit expansion that Bit 8, which is the Q bit, is 1. But the trigger is programmed to look for a byte with Bit 8 = 0 (10_{16}).

Although ASCII defines only seven information bits, the status of the eighth bit can always be examined by using the cursor to show the bit expansion.

5.2.6 Enhance Parity. You may find it useful to be able to see at a glance what bytes have Bit 8 = 1 (Mark parity bit). On the Parameters 2 menu, in the ENHANCE field, select PARITY. Return to Monitor Mode.

Each byte having Mark parity bit is now displayed with a horizontal bar through it (Figure 5-10). Control characters with mark parity (specifically the frame and packet control and supervisory octets) are legal because parity applies only to the INFO and DATA fields.

Display the Program Summary and notice the entries under Triggers 7 and 8 (Figure 5-11). When you select ENHANCE PARITY, these two triggers are automatically programmed to count parity errors. If you need Triggers 7 and 8 (or Counters 3 and 4) for other purposes, you can clear each of them with CONTROL plus CLEAR FIELD. This makes the two triggers and the two counters available, but it does not clear the ENHANCE PARITY selection on the CRT display.

5.3 OTHER BISYNC-FRAMED DATA.

5.3.1 Same Code for Framing and Data. When both framing and data are EBCDIC or ASCII, select EBCDIC or ASCII for the CODE on the Parameters 1 (Basic Monitor) menu. The synchronization characters will be automatically determined: the system will look up the SY character in the selected code chart and enter it--including appropriate adjustments for parity.

5.3.2 Different Code for Framing and Data. In this case, the synchronization characters must be entered in hexadecimal to override the default

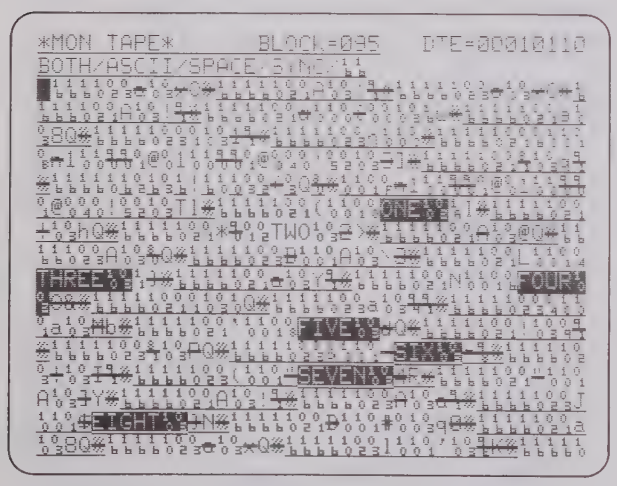


Figure 5-10

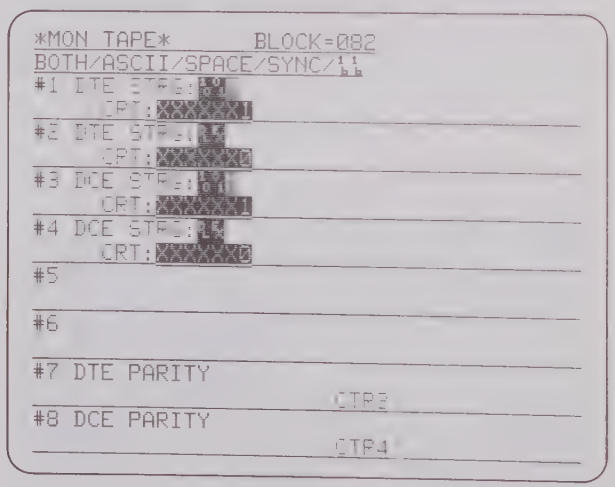


Figure 5-11

selection for the selected code. Select the data CODE (usually EBCDIC or ASCII), then the correct number of bits and parity as applicable.

Enter each synchronization character using the HEX key followed by two digits. The usual selections are as follows:

EBCDIC = 32 32_{16}

ASCII odd, space, or no parity = 16 16_{16}

ASCII even parity (rarely used) = 96 96_{16}

An example of the setup for EBCDIC-framed ASCII is shown in Figure 5-12.

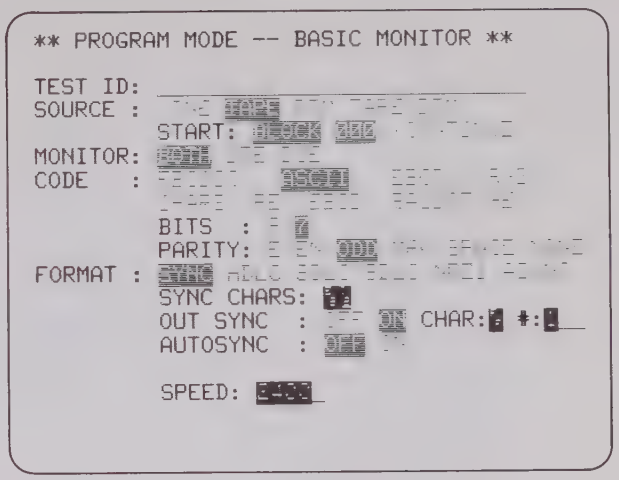


Figure 5-12

6 SDLC Data

6.1 GENERAL

SDLC may be implemented in several ways depending on the application. The data on Blocks 150 to 250 of the training tape represents traffic with a 3276 terminal on a multi-drop circuit.

6.2 PARAMETERS SETUP

The SDLC data on the training tape runs from Block 150 to 250.

On the Parameters 1 menu, program the 3500 to START at BLOCK 150. The data CODE is EBCDIC, and the FORMAT is SDLC, since SDLC uses HDLC (bit stuffing) framing. Figure 6-1 shows the Parameters 1 setup.

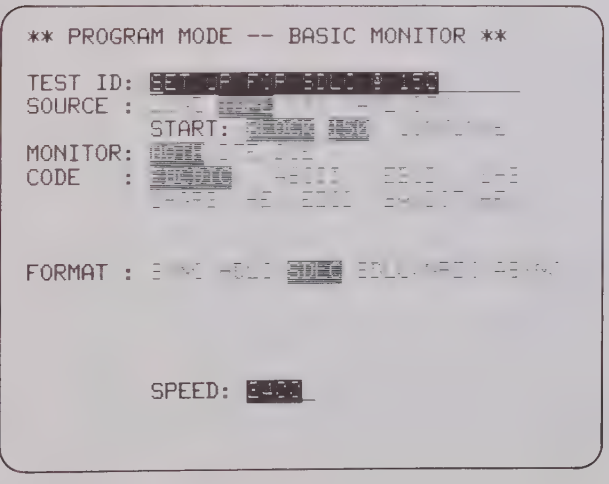


Figure 6-1

On the Parameters 2 menu, select DUAL line since we may anticipate simultaneous transmission by the DCE and DTE (Figure 6-2).

6.3 DISPLAY

Operate MONITOR. Playback will begin at BLOCK 150. When the display looks similar to Figure 6-3 (Block 151 of the tape), FREEZE the CRT and operate the B key.

6.3.1 Idle Line. Use the F key to tab to the NSA frame (Figure 6-4). Figure 6-4 shows that on the DTE line idle

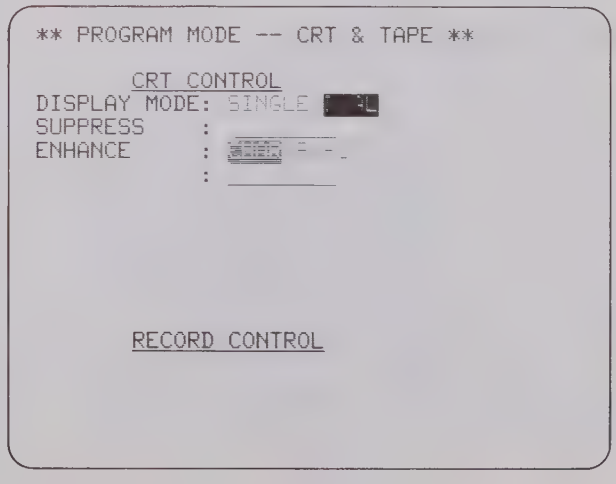


Figure 6-2

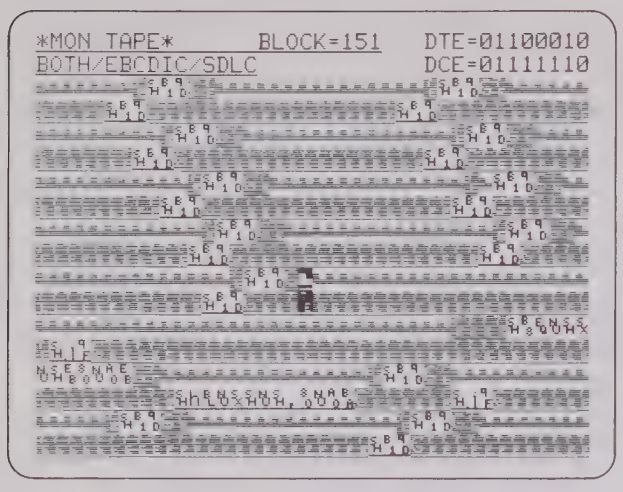


Figure 6-3

mark is represented by the L-shaped fill symbol. Each DTE frame begins and ends with at least one Flag (7E).

The DCE line (underlined) idles with Flags.

6.3.2 Hexadecimal Display. Figure 6-4 shows that the 3500 displays many bytes as mnemonics. Operate CONTROL plus HEX to display these characters in hexadecimal as shown in Figure 6-5.

6.4 ZERO INSERTION

With the cursor key, tab to the blocks containing = (Figure 6-6). The

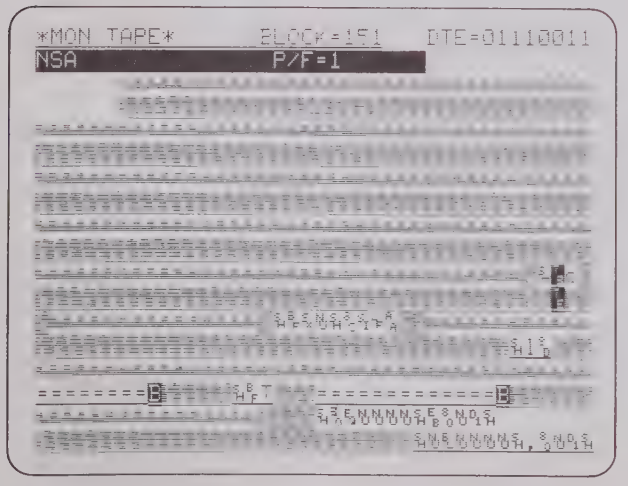


Figure 6-4

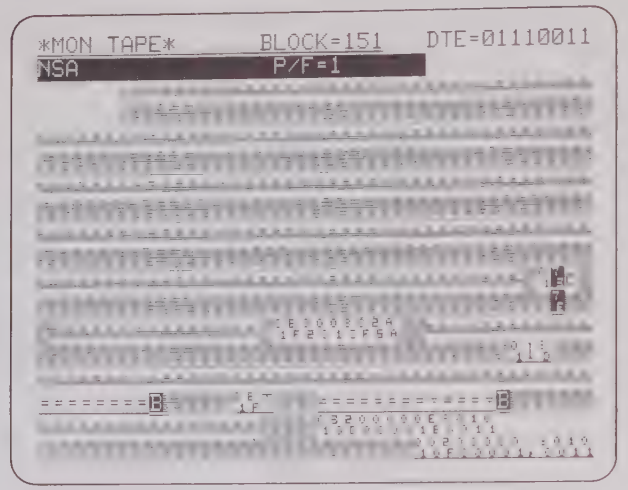


Figure 6-5

training tape contains sequences in which the idle 7E Flags have been accidentally stuffed with zeros. Figure 6-6 shows two blocks containing ===== and ending in B for Bad block. The bit expansion for the DCE cursor character is 0111 1110, indicating that the = symbol represents the $7E_{16}$ Flag.

Operate MANUAL UNFREEZE and let the tape run until about Block 190, where messages containing many of the numeral 7 will appear (see Figure 6-7). FREEZE the CRT.

6.4.1 Fill Characters: Display of (De)stuffed Zeros. An EBCDIC 7 is $F7_{16}$, bit pattern 1111 0111 (notice

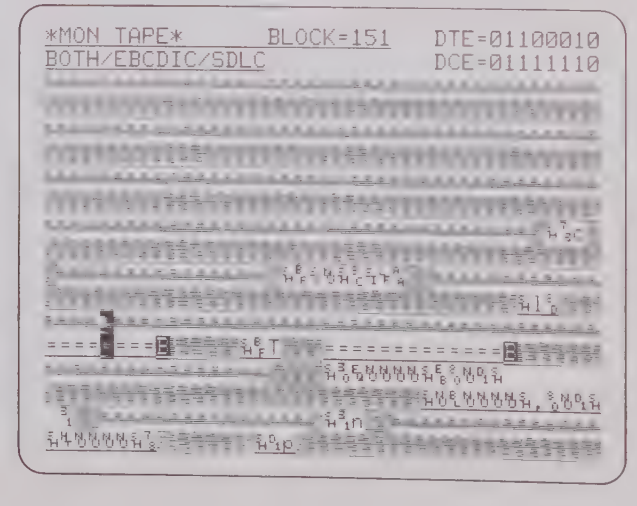


Figure 6-6

the breakdown in Figure 6-7). Two consecutive 7's contain seven consecutive 1's. Therefore, one zero is inserted for every 7, and a sequence of eight 7's on the DTE gains eight bits or one byte over the DCE. This gain is represented by an L-shaped fill symbol following every eighth 7 on the DTE in order to maintain time correlation with the DCE.

No fill characters have been inserted in the DCE string of 7's near the bottom of Figure 6-7 because the DTE side idles with mark and time correlation is not relevant.

In dual-line SDLC display on the 3500, you will see the L-shaped fill symbol inserted in the data whenever

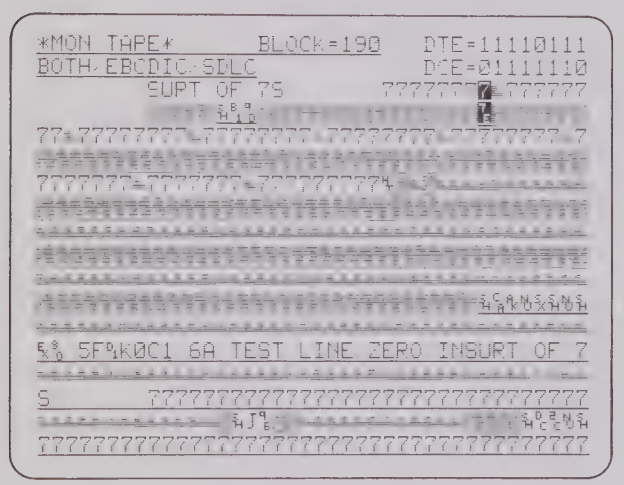

MON TAPE BLOCK=190 DTE=11110111
BOTH/EBCDIC/SDLC DCE=01111110
SUPT OF 7S
5F 02 00 01 8C 0F 25 29 MS.
5F 02 00 01 8C 0F 25 29 INSURT OF 7
S

Figure 6-7

eight bits have been inserted and time correlation must be maintained.

> NOTE: The fill symbols will not necessarily appear in the same place each time data is replayed because the accumulation up to eight is a continuous process.

6.4.2 Suppress Idle. So far, the SDLC data has been displayed with a large number of idle Flags. It has been instructive to see them, but it will be more efficient to suppress them. On the Parameters 2 menu, enter a Flag (CONTROL plus FLAG) on the SUPPRESS data entry line and again MONITOR the data. Figure 6-8 shows the compact

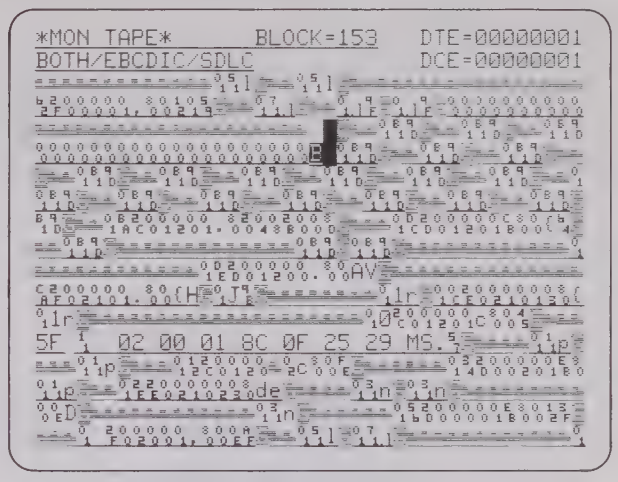


Figure 6-8

data display around Block 153 with the EBCDIC control character mnemonics converted to hexadecimal (using CONTROL plus HEX).

6.5 NETWORK MEASUREMENTS

We shall program triggers to make the measurements listed in Figure 6-9. First, select the Statistics menu and name the counters and timers as shown on the figure. Frame efficiency can be measured by counting information and noninformation frames. Press TRIGGER to view the Trigger Summary and be sure the triggers are in default condition; i.e., the summary is clear.

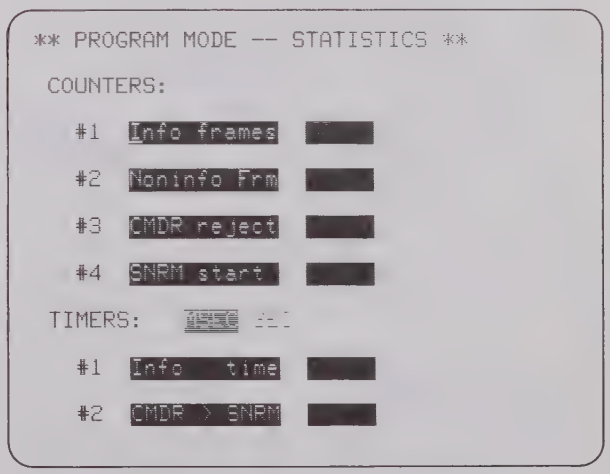


Figure 6-9

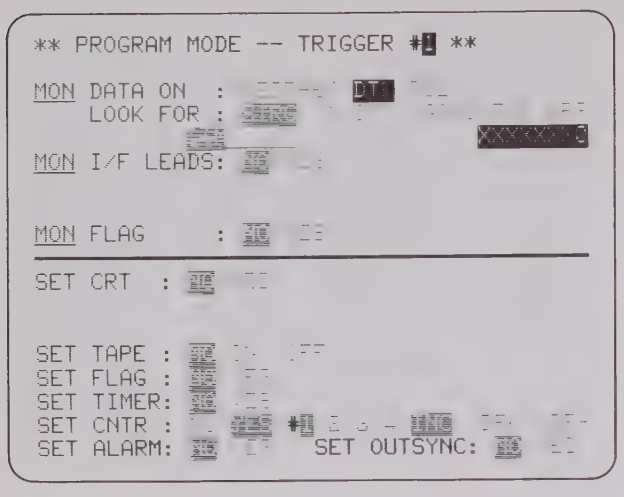


Figure 6-10

Display the Trigger 1 menu. Select DTE and enter a string to define information frames; namely, Flag, Not Equal Flag, Bit Mask with Bit 1 = 0. Set Counter 1 to increment and thus count information frames (see Figure 6-10).

Set up Trigger 2 to count noninformation frames on Counter 2 (as in Figure 6-11).

To use Trigger 3 to count Command Reject (CMDR) frames on Counter 3, enter a DTE string to identify the CMDR frame: Flag; Not Equal Flag; HEX, 9,

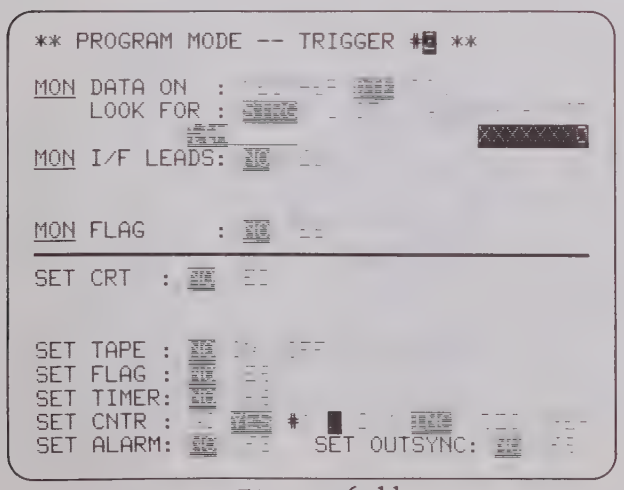


Figure 6-11

7. (See Appendix C for the bit patterns of SDLC commands.)

Set Normal Response Mode (SNRM) frames appear on the DCE line. To count them on Trigger 4, set Counter 4 to increment when the DCE string Flag, Not Equal Flag, 93_{16} is received.

The Trigger Summary should now look like Figure 6-12.

To measure the total line time actually used for transmitting information you can set a timer to run from receipt of the information control frame byte through the closing Flag. The string already entered on Trigger 1

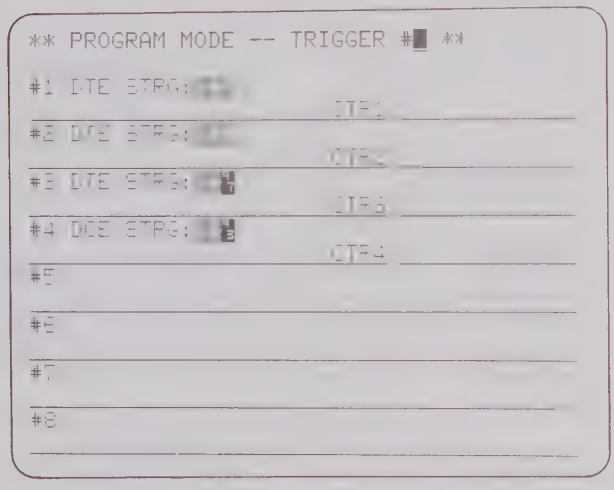


Figure 6-12

can be used to start Timer 1. Select CONT to permit the timer to accumulate the total information frame time.

None of the triggers includes a string to define the end of a frame, so select the Trigger 5 menu. Enter a DTE string of Not Equal Flag, Flag and set Timer 1 to STOP.

The strings needed to measure the total time between Command Reject and Set Normal Response Mode have already been entered on Triggers 3 and 4, so you can use these triggers to set a timer. On Trigger 3, set Timer 2 to CONTinue, and on Trigger 4, set Timer 2 to STOP.

The Trigger Summary should now appear as in Figure 6-13.

From Figure 6-14, we can compute the frame efficiency on the test circuit as 249/(3321 + 249) = 7%.

SNA uses headers on information frames for equipment control, configuration, initialization, and other purposes. Triggers can be used to look for specific headers, to locate the user data, and to measure it. These details are application dependent and the operator must be quite familiar with the system under test.

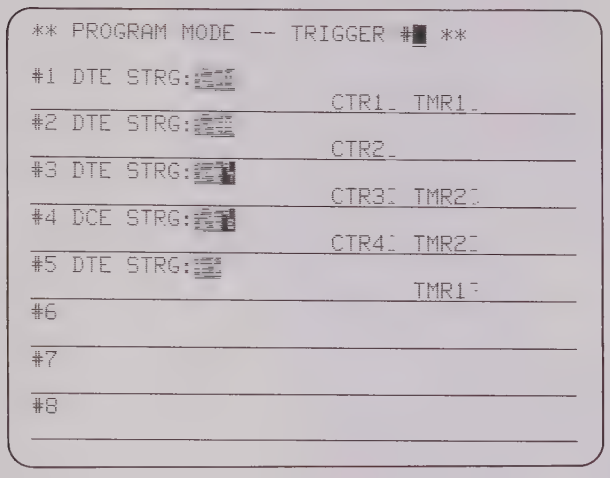


Figure 6-13

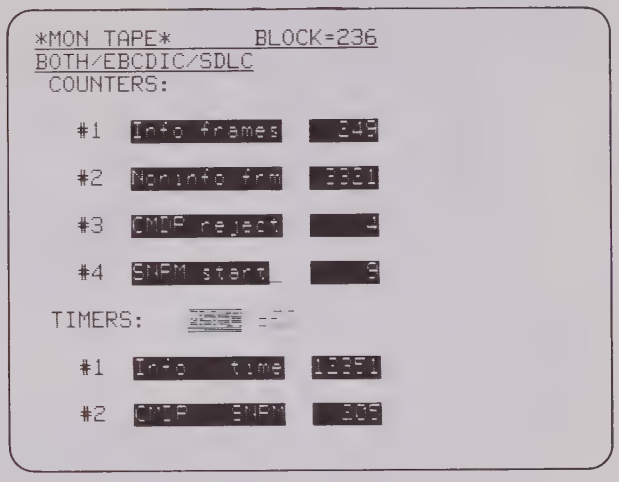


Figure 6-14

7 Recording

CAUTION: Do not use the training tape to save a program or record data. (On some of the training tapes, the record tab has been removed to help avoid this error.)

7.1 PREFORMATTING TAPES

New tapes should be preformatted before use to retension them and provide block numbers. (See the Technical Manual for detailed instructions.)

7.2 SAVING A PROGRAM

CAUTION: Always verify a tape as blank (or as having a program that is no longer of interest) before you SAVE a program on it.

You should do this before the new program has been developed to avoid the possibility of writing over it with whatever may be on the tape.

(1) Insert the tape and press LOAD PROGram: the name of any resident program or "NO PROGRAM FOUND" will be displayed.

(2) Remove the cartridge and position the RECORD tab toward the outside of the case (this is the record position).

(3) Develop the desired program in the 3500.

(4) Insert the new tape (with the record tab ON). Press the SAVE PROGram key; then PROGRAM and the Program Selections menu will appear.

(5) Always operate the LOAD PROG key to verify that the program has transferred to the tape. You should review each of the four menus--

Parameters 1, Basic Monitor;
Parameters 2, CRT and Tape;
Trigger Summary;
Statistics, Counters and Timers.

(6) Remove the tape and move the RECORD tab to the center of the case to protect the tape.

(7) Fill out a label with the program menu and attach it to the case.

7.3 RECORDING DATA

7.3.1 Manual Recording. Only one operation is required for manual recording:

(1) Position the RECORD tab of the tape toward the outside edge of the case.

(2) In the MONITOR mode, press the MANUAL START key in the CAPTURE MEMORY zone of the keyboard. The

RECORD LED on the panel will go ON and the BLOCK number will increment for each 2400 characters received.

(3) To stop recording, press MANUAL STOP.

7.3.2 Program Control. When LINE has been selected as data source, triggers can be used to start and (or) stop data recording. The RECORD and TRIGGER LEDs on the panel will indicate whether the tape is recording.

7.3.3 Override. When the tape is under program trigger control, you may use the MANUAL START and MANUAL STOP keys to override the triggers in the same way that you can override the CRT display freeze. Use RESUME TRIGGER to restore program control.

Appendix A
Using This Manual with the INTERVIEW 3000

This training manual can be used with the INTERVIEW 3000 (which does not have a tape). The following considerations are important.

(1) Obtain a source of HDLC-framed signals, preferably X.25 as that is what has been used for the basic part of the manual. Connect the signals to be monitored to the RS-232/V.24 connector on the rear of the instrument.

(2) Since you have no taped program, you will need to program the Parameters 1 menu before you can monitor data. You should, therefore, read Section 4, through Section 4.1.1, Basic Monitor Menu, before you read Section 3 in detail.

(3) The Parameters 1 menu should show SOURCE: LINE for all tests. Select HDLC for FORMAT.

(4) Throughout, study the figures in the manual before you apply the text to your own data.

(5) You can skip Sections 2.2, 2.3, 2.4, and 7, which pertain only to the INTERVIEW 3500.

An INTERVIEW 3000 may be field-upgraded to a 3500 by adding a Tape Upgrade Kit, OPT-895-01-2. Please specify serial number and software version (see power-up display of your unit) when you order.

Appendix B
Introduction to Bit-Oriented Protocols

ADCCP (Advanced Data Communication Control Procedures) is the most general of the bit-oriented protocols. Most of those in use are subsets of ADCCP. Because its provisions for extended addressing and extended control fields have not been generally implemented, they will not be discussed here.

B.1 OVERVIEW

A bit-oriented protocol can be viewed as three essentially separate parts:

1. The BASIC FRAME, needed to coordinate transmissons.
2. PACKETS, the content or information to be sent, for example.
3. The FRAMING around each transmission, essential for synchronization.

Most Bit-Oriented Protocols (BOP) have the following general characteristics:

- Because specific bits within a control byte have individual significance, each bit is accessible for analysis.
- Messages need not be individually acknowledged: a specific number of messages may be outstanding without acknowledgment.
- Each transmission consists of a frame with a minimum of four 8-bit bytes: one address, one control, and two frame check (FCS) bytes.
- Transmission by the DTE and the DCE is simultaneous, which increases throughput.
- Data messages can be sent in any binary format (memory dumps, for example), because the information content is "transparent" to the framing.
- All bytes used for control purposes are eight information bits. Information characters may be 8 bits or less, depending on what protocol is used for the information field.

Particular BOP implementations may exclude some of these or include other characteristics.

B.2 BASIC FRAME

The basic (that is, minimum) frame structure is four 8-bit bytes.

Byte 1	Byte 2	Byte 3	Byte 4
ADDRESS	CONTROL	FCS_1	FCS_2

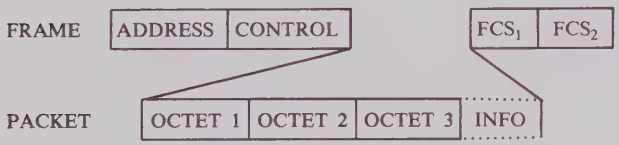
The address and control bytes are defined by their positions.

If a frame contains a message or data (information frame), additional bytes are inserted. Certain control frames also require more bytes. Additional bytes of either type always follow the control byte and their presence is signaled in the control byte.

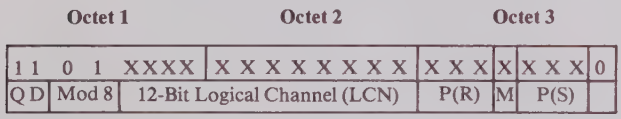
Bit patterns and command acronyms used in X.25 and SDLC frame-control bytes are listed in Appendix C.

B.3 PACKET

In X.25 and X.75 protocols, an information frame is by definition a Packet. A packet always contains at least three octets (octet is the CCITT term for byte):



The INTERVIEW 3500 analyzes the first three octets of the packet.



Packets usually contain up to 128 bytes of information. If the block to be sent is larger and requires several packets, the M bit (More data bit) within the packet-type octet (Octet 3) is set to 1. This serves the same function as an ITB in BISYNC. The last packet of a contiguous block has the M bit set to 0.

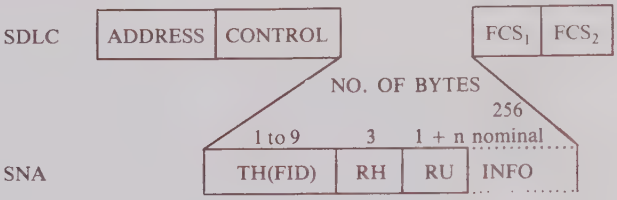
The 3500 displays the LCN, P(R), and P(S), as well as Q, D, or M if any of these three bits is set to 1.

If the modulus is 128 (bits 6 and 5 of Octet 1 set to 10), the 3500 displays only the LCN and MOD 128.

B.4 SDLC-SNA

SDLC-SNA is a protocol that includes numerous application-dependent variables. It accommodates control of terminals and other hardware-software devices as well as various host application programs. It is not a general-purpose network protocol such as X.25, although the basic principles are the same.

SDLC can be considered equivalent to frame level and SNA roughly equivalent to packet level:



Since SDLC may address multiple stations (controllers), the address byte can have many values. The ultimate destination or origin (device) address is contained within the FID field.

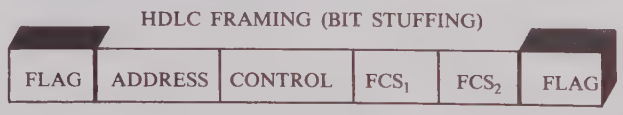
The 3500 displays all control command acronyms for the SDLC control byte.

For in-depth treatment of SDLC-SNA, see IBM Technical Bulletin G 320-6024, "SNA Architecture Reference Summary."

B.5 FRAMING

Framing characters (or signals) precede and follow each frame (four or more 8-bit bytes) to synchronize the characters of the frame.

B.5.1 HDLC Framing. At least one Flag (0111 1110, $7E_{16}$) must precede and end each frame.



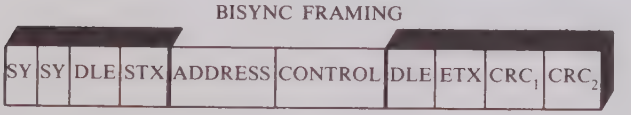
A technique called "zero bit stuffing" is used to prevent having more than five consecutive 1 bits on the line except when the Flag is sent.

A special detector monitors the line for the Flag signal. The first non-Flag byte is the address byte and the next Flag signals that the frame has terminated.

In the INTERVIEW 3500, the term BOP is reserved for HDLC framing.

B.5.2 Transparent BISYNC Framing. The BISYNC protocol includes provisions for sending transparent binary data. Many networks have implemented bit-oriented protocols using transparent BISYNC framing because the communication hardware for HDLC was not available.

BISYNC FRAMING



Either EBCDIC (SYN = 32) or ASCII (SYN = 16) framing may be used. Whichever framing is used, synchronization is absolutely independent of the information code. EBCDIC, ASCII, or any other code may be used for the information code.

The rules for sending transparent data in any BISYNC protocol are followed. If DLE occurs in the data stream a second DLE is inserted to qualify it as a valid 10_{16}. Buried synchronization characters may also be present (e.g. DLE, SYN) and must be ignored when message content is reviewed.

Frame check bytes (FCS) are replaced by the CRC characters used with BISYNC.

In the INTERVIEW 3500, SYNChronous FORMAT must be selected to monitor transparent BISYNC-framed data.

B.6 NOTES

B.6.1 Bit Order and Numbering. Lack of consistency between and even within documents has made misunderstandings about bit order and numbering a common problem.

- In INTERVIEW 3500 literature and display, the first serial bit is consistently the rightmost bit and is designated as Bit 1.

- Most documents specify Bit 1 as the first serial bit in a byte and Bit 8 as the last serial bit.

- In IBM literature, Bit 7 is usually the first serial bit and Bit 0 is the last bit.

- In some documents the first serial bit is the leftmost bit and in some cases the first serial bit is the rightmost bit.

- Bytes are often represented hexadecimally. In this case, the rightmost bit is the lowest-order bit and also usually the first serial bit.

- CCITT X.25 transposes the order of the bits on the printed tables for frame and packet. Bit 1 is on the right for all packet tables and is always the first serial bit. Conversion to hexadecimal from these tables is obviously an opportunity for confusion.

- The best guide to bit order in any table is to identify an INFO command or DATA Packet; then establish the bit having a defined value of 0 as the first serial bit.

- A series of bytes (or fields or characters) is usually presented with the first sequential byte in the leftmost position.

	Bit Designation							
Documentation	Last bit sent							First bit sent
CCITT	8	7	6	5	4	3	2	1
Most IBM documentation	0	1	2	3	4	5	6	7
INTERVIEW 3500	8	7	6	5	4	3	2	1

The following control frame is an example of the convention used in 3500 documentation:

Bit pattern	1	0	1	0	0	1	1	0
Acronyms	N(R)			P/F	N(S)			INFO
Hexadecimal	A				6			

The hexadecimal representation of this byte on the 3500 screen would be A6. The first bit transmitted is a zero, indicating that this is an information frame and an information field will follow this byte.

B.6.2 Protocol Characteristics.

(1) X.25 and X.75 specify basically a point-to-point, DTE-to-NODE-(DCE) connection. Supervision, acknowledgment, and so on are generally best understood in these terms rather than with regard to end-to-end use. At packet level, the recently introduced D bit can indicate end-to-end delivery significance. (D = 0 for local significance.)

(2) X.25 idles with Flags ($7E_{16}$) on both paths.

(3) SDLC permits multiple stations on a network. The return path idles with mark between frames from different stations. Each frame is preceded and followed by one Flag. The outbound path idles with Flags.

(4) SDLC NRZI is used with or without modem clock. The circuit should be tested in whichever manner it is actually used.

Appendix C

Frame and Packet Mnemonic Displays

The 3500 will display frame-control acronyms for X.25 (including LAP B), X.75, and SDLC. Therefore two different acronyms may appear for one control byte.

Packet acronym expansions are displayed for X.25 and X.75 for modulo 8. Modulo 128 is so indicated without further explanation.

Table C-1
Frame-Control Mnemonics

Bit Pattern	SDLC or SDLC NRZI		7E/X.25 or BSC/X.25	
8 7 6 5 4 3 2 1	Mnemonic	Definition	Mnemonic	Definition
N(R) P N(S) 0	INFO	INFOrmation	INFO	INFOrmation
N(R) P/F 0 0 0 1	RR	Receiver Ready	RR	Receiver Ready
N(R) P/F 0 1 0 1	RNR	Receiver Not Ready	RNR	Receiver Not Ready
N(R) P/F 1 0 0 1	REJ	REJect	REJ	REJect
N(R) P/F 1 1 0 1	SREJ	Selective REJect	SREJ	Selective REject
0 0 0 P/F 0 0 1 1	NSI	Non-Sequenced Information	---	---
0 0 0 P/F 0 1 1 1	SIM/RQI	Set Initialization Mode/ReQuest Initialization	---	---
0 0 0 F 1 1 1 1	SARM/ROL	Set Asynchronous Response Mode/ Request OnLine	DM/SARM	Disconnect Mode/ Set Asynchronous Response Mode
0 0 1 P/F 0 0 1 1	NSP	Non-Sequenced Poll	---	---
0 0 1 P 1 1 1 1	---	---	SABM	Set Asynchronous Balance Mode
0 1 0 P 0 0 1 1	DISC/RQD	DISConnect/ReQuest Disconnect	DISC	DISConnect
0 1 0 P/F 0 1 1 1	RGA	Remote Go-Ahead	---	---
0 1 1 F 0 0 1 1	NSA	Non-Sequenced Acknowledge	UA	Unnumbered Acknowledge
1 0 0 F 0 1 1 1	CMDR	CoMmanD Reject	FRMR	FRaMe Reject
1 0 0 F 0 0 1 1	SNRM	Set Normal Response Mode	---	---
1 0 1 P/F 1 1 1 1	XID	eXchange station ID	---	---
1 1 0 P/F 0 1 1 1	CFGR	ConFiGuRe	---	---
1 1 1 P/F 0 0 1 1	TEST	link TEST	---	---
1 1 1 F 1 1 1 1	BCN	BeaCoN	---	---
All other patterns		UNKNOWN		UNKNOWN

Table C-2
Packet-Type Mnemonics

Octet 3								Display		
8	7	6	5	4	3	2	1	(XXX=HEX 000-FFF)	Mnemonic	Definition
0	0	0	0	1	0	1	1	LCN = XXX	CALL	CALL
0	0	0	0	1	1	1	1	LCN = XXX	CALL ACC	CALL ACCept
0	0	0	1	0	0	1	1	LCN = XXX	CLEAR	CLEAR
0	0	0	1	0	1	1	1	LCN = XXX	CLEAR C	CLEAR Confirm
P(R)			M	P(S)			0	LCN = XXX	DATA	DATA
1	1	1	1	0	0	0	1	LCN = XXX	DIAG	DIAGnostic
0	0	1	0	0	0	1	1	LCN = XXX	INT	INTerrupt
0	0	1	0	0	1	1	1	LCN = XXX	INT CONF	INTerrupt CONFirm
P(R)			0	0	0	0	1	LCN = XXX	RR	Receiver Ready
P(R)			0	0	1	0	1	LCN = XXX	RNR	Receiver Not Ready
P(R)			0	1	0	0	1	LCN = XXX	REJ	REJect
0	0	0	1	1	0	1	1	LCN = XXX	RESET	RESET
0	0	0	1	1	1	1	1	LCN = XXX	RESET C	RESET Confirm
1	1	1	1	1	0	1	1	LCN = XXX	RSTRT	ReSTaRT
1	1	1	1	1	1	1	1	LCN = XXX	RSTRT C	ReSTaRT Confirm
P(R)			0	1	1	0	1	LCN = XXX	SREJ	Selective REJect
All other									UNKNOWN	

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EQUIPMENT MODEL _____ SN _____ SOFTWARE VERSION _____

APPLICATION:

DATA COMM MAINTENANCE _____ DEVELOPMENT OF HARDWARE _____

DEVELOPMENT OF SOFTWARE _____ OTHER _____

BACKGROUND OF USER:

HARDWARE _____ SOFTWARE _____

DATA COMM _____ OTHER _____

NAME OF USER _____ MAIL STOP _____

COMPANY _____ DIVISION _____

STREET _____

CITY _____

STATE _____ ZIP _____ COUNTY _____

TELEPHONE _____ + _____ - _____ TELEX _____

USER WANTS TO RECEIVE:

APPLICATION INFO ONLY _____ NEW PRODUCT INFO _____ ALL RELATED PRODUCT INFO ____

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Please mail or telex the above information directly to:

Atlantic Research Corporation
5390 Cherokee Avenue
Alexandria, Virginia 22314, USA
Attn: Mr. Alex Nagy
Tel: 703/642-4412 Telex: 248893

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Test Equipment

- ☐ INTERSHAKE
- ☐ INTERVIEW
- ☐ INTERVIEW II
- ☐ INTERVIEW 3000
- ☐ INTERVIEW 3500
- ☐ DATA TECH 9600
- ☐ PMK04
- ☐ Other _____

Tech Control Products/Systems

- ☐ NCS-100
- ☐ RCS-100
- ☐ Digital Patching/Switching Please specify _____
- ☐ VF Patching/Switching Please specify _____
- ☐ Coax Patching/Switching Please specify _____
- ☐ TTY Patching/Switching Please specify _____

Name

Company

Address

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Send the above User names to:

Atlantic Research Corporation
5390 Cherokee Avenue, Alexandria, VA 22314
(703) 642-4000

Attn: Mary Clark, Marketing Communications